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# SYSTEMATIC AND ECOLOGICAL INVESTIGATIONS AND BIBLIOGRAPHY.

## ADVERTISEMENT.

The United States National Herbarium, which was founded by the Smithsonian Institution, was transferred in the year 1868 to the Department of Agriculture, and continued to be maintained by that department until July 1, 1896, when it was returned to the official custody of the Smithsonian Institution. The Department of Agriculture, however, continued to publish the series of botanical reports entitled "Contributions from the United States National Herbarium," which it had begun in the year 1890, until on July 1, 1902, the National Museum, in pursuance of an act of Congress, assumed responsibility for the publication. The first seven volumes of the series were issued by the Department of Agriculture.

RICHARD RATHBUN,
*Assistant Secretary, Smithsonian Institution,*
*in charge of the United States National Museum*

SMITHSONIAN INSTITUTION

UNITED STATES NATIONAL MUSEUM

# CONTRIBUTIONS

FROM THE

# UNITED STATES NATIONAL HERBARIUM

VOLUME 13

Vol. XIII

## SYSTEMATIC AND ECOLOGICAL INVESTIGATIONS AND BIBLIOGRAPHY




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# PREFACE.

The 12 parts which form this volume comprise 19 different papers. The first of these, by William R. Maxon, is the second of a series designed as a convenient means of bringing together the results of his studies of tropical American ferns, of which the National Museum has acquired large collections within recent years. In his report upon Baron von Türckheim's recent Guatemalan collections Mr. Maxon directs attention to the lack of adequate material from the humid region of eastern Mexico. This deficiency exists not only in the case of the ferns and allied plants, but to a large extent in that of the phanerogams as well. It is to be hoped that means may be found to carry on in this region botanical exploration of the same character and extent as that which has been devoted in recent years to the plateau of Mexico. We shall then have a thorough knowledge of the flora of the low humid region, instead of an imperfect knowledge resting largely on collections of half a century or more ago.

The second number, consisting of a paper prepared by Dr. J. N. Rose in cooperation with J. A. Purpus, of the Darmstadt Botanical Garden, Germany, contains the descriptions of three interesting new species of Echeveria from southern Mexico. The beauty of two of these is such as to warrant their introduction into ornamental cultivation along with many other beautiful and striking species of Echeveria which have been discovered in Mexico during the last few years.

The grasses of Alaska, treated in part 3, are of great interest, not only from the standpoint of technical botanical science, but because they form one of the great natural resources of that region, as yet little utilized. Although many lists of grasses from Alaskan localities have been published, no comprehensive and critical work on the whole subject exists. The present paper, prepared by Prof. F. Lamson-Scribner and Mr. Elmer D. Merrill, brings our knowledge up to date and will serve as a working basis for the study of Alaskan grasses until that vast region has been more fully explored and its vegetation more thoroughly investigated.

Part 4 is the second paper of a series by Henry Pittier, of the Department of Agriculture, entitled New and Noteworthy Plants from Colombia and Central America, the first having been published in volume 12 of the Contributions from the United States National Herbarium, pages 171 to 181. It consists chiefly of descriptions of

new and little known species of Asclepiadaceae and Cucurbitaceae, keys to the species of several genera, and the characterization of two new genera, Frantzia and Polakowskia, from Costa Rica.

In part 5 Mr. O. F. Cook, of the Department of Agriculture, discusses the relationship of the ivory palms, a matter which has long been the subject of doubt and indecision among botanists. In his various expeditions to tropical America in the interest of agriculture, Mr. Cook has been able to make extensive observations on the various groups of palms, including Manicaria, apparently the nearest relative of the ivory palms. This has given him important first-hand information bearing on the question of family relationship.

Part 6 consists of two papers by Paul C. Standley, assistant curator in the Division of Plants, which are designed to assist students of the taxonomy and distribution, and to some extent of the ecology, of the New Mexican flora. The first contains an annotated list of all those plants that have their type localities in New Mexico. So far as can be learned no list of this kind has ever been prepared before for any State or Territory, in spite of the obvious advantages which such a work offers. It is interesting to learn that from New Mexico alone almost 700 new plants have been described. Accompanying the list of species is a list of localities with the names of the species described from each; and in order to facilitate the finding of the localities, a map of New Mexico has been prepared, upon which all the type stations have been conspicuously marked. As an aid in the study of the collections made by some of the earlier botanical explorers of this region notes regarding their itineraries have been collected and tabulated. It has been found necessary in preparing the list of species to form several new binomials; these will be found listed at the end of the paper. The bibliography which forms the second of the papers is intended to be a complete index to the literature of New Mexican botany.

In part 7, consisting of a paper by Mr. Henry Pittier, an attempt has been made to describe systematically the various American forms of Castilla, along lines indicated in a former paper by Mr. O. F. Cook. Investigations made by the United States Department of Agriculture during the last 10 years have shown that the Central American rubber tree is not, as generally accepted, a homogeneous species, but that it consists of several well characterized forms which differ materially in their geographic distribution and climatic correlation. Hitherto rubber planters have made no distinction between these forms, and many of the unsuccessful attempts at the cultivation of Castilla as a rubber-producing tree may be traced to the want of discrimination in the choice of the form from which the seeds were taken. Although Mr. Pittier has brought to this work a long practical experience in the field, and has had an abundant supply of material

for study, our knowledge of the various forms will still be far from complete. Their number may be reduced or increased and their relative status altered. Nevertheless, the present paper will remain the first attempt at a thorough study of the group. In recent years new species have been discovered in South America, and the areal limits of the genus have thus been extended far beyond the Isthmus to Bolivia and eastern Brazil. It is almost certain that other species, hitherto hidden in the unexplored forests of South America, will come to fill the gaps in the distribution of the genus.

Of the two papers comprised in part 8 the first, by J. N. Rose and Paul C. Standley, deals with the Mexican species of Talinum, a genus of portulacaceous plants which has been much neglected in the past, only a few species having been known from Mexico. Studies of living plants in Washington and of accumulated herbarium material however, have enabled the writers to revise all the proposed Mexican species of the genus and make numerous additions. Of the 18 species here recognized, 10 are new to science. The second paper, by J. N. Rose, records two additional species of the recently described umbelliferous genus Harperella.

Part 9 is a paper by Dr. J. N. Rose in continuation of his Studies of Mexican and Central American Plants. It contains a brief account of his seventh journey to Mexico. Most of the plants discussed are new or recently described species which Doctor Rose discovered in the field or while studying various groups of Mexican plants. Some 24 new species of Crassulaceae are here described. This is a remarkable addition to our knowledge of this group, for the family had been extensively studied during several years prior to 1905, when the North American species were monographed. Some of the present new species are of horticultural interest. *Echeveria crenulata*, *E. holwayi*, and *E. gloriosa* are somewhat similar to the well-known *E. metallica* of our greenhouses. To Urbinia, a recent segregate from Echeveria, two more species are added. One of these, *Urbinia purpusii*, is a curious plant suggesting in habit and foliage the south African genus Haworthia. The plant is worthy of a place in every good succulent collection. In cultivation it has shown no tendency to produce suckers and perhaps its propagation can be accomplished only by seed.

Part 10 is composed of six short papers. The first, entitled The Gyrophoraceae of California, by Dr. Albert W. C. T. Herre, is a synoptic treatment of the California members of the group of lichens formerly associated under the name Umbilicaria, but now regarded as of two genera, Gyrophora and Umbilicaria, the latter represented in California by only a single species. The second paper, The plant life of Ellis, Great, Little, and Long Lakes in North Carolina, by William H. Brown of the Bureau of Fisheries, was prepared inci-

dentally to an inquiry into the natural supply of food for fishes in those lakes. The remaining papers are: A Revision of the Subgenus Cyclobothra of the Genus Calochortus, by the late Joseph H. Painter; A Revision of the Cichoriaceous Genera Krigia, Cynthia, and Cymbia, by Paul C. Standley, assistant curator in the Division of Plants; New or Noteworthy Plants of the Eastern United States, by E. S. Steele, editorial assistant in the Division of Plants; and Two New Shrubs from Lower California, by Paul C. Standley and E. A. Goldman.

Part 11, an additional paper by Mr. Standley, is an account of the Mexican and Central American plants of the family Allioniaceae. It follows a similar paper dealing chiefly with the representatives of the family in the United States, published in volume 12 of this series, and embodies the results of field work and of a study of specimens found in all the larger herbaria of this country. As in many other families of Mexican plants, the material of the Allioniaceae was found in a very confused state. The total number of representatives of the family reported from the region under discussion is 113, several of which are described here for the first time.

Part 12 is the third number of Mr. Pittier's series already mentioned. An imperfectly known group of the mulberry family is revised, with the addition of three new species, and new species are described and old ones discussed in several other families. A large part of the species are trees, some of them of economic value. The results offered are based on actual field work by Mr. Pittier.

FREDERICK V. COVILLE,
*Curator of the United States National Herbarium.*

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MAP.

Colored map of New Mexico..... In pocket.

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UNITED STATES NATIONAL MUSEUM

# CONTRIBUTIONS

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By WILLIAM R. MAXON




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# PREFACE.

The present paper by Mr. Maxon is the second of a series designed as a convenient means of bringing together the results of his studies of tropical American ferns, of which the National Museum has acquired large collections within recent years. In his report upon Baron von Türckheim's recent Guatemalan collections the writer directs attention to the lack of adequate material from the humid region of eastern Mexico. This deficiency exists not only in the case of the ferns and allied plants, but, to a large extent, in that of the phanerogams as well. It is to be hoped that means may be found to carry on in this region botanical exploration of the same character and extent as that which has been devoted in recent years to the plateau of Mexico. We shall then have a thorough knowledge of the flora of the low humid region instead of an imperfect knowledge resting largely on collections of half a century or more ago.

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# STUDIES OF TROPICAL AMERICAN FERNS—NO. 2.

By William R. Maxon.

## INTRODUCTION.

The following paper is in continuation of "Studies of tropical American ferns," of which the first number was published in volume 10[a] of the Contributions from the U. S. National Herbarium, and is along the lines indicated in the introduction to that number.

## NOTES UPON FERNS RECENTLY COLLECTED IN GUATEMALA BY BARON VON TÜRCKHEIM, WITH DESCRIPTIONS OF SEVERAL NEW SPECIES.

At intervals during the past year and more the writer has examined with great interest a considerable number of well-prepared Guatemalan ferns, collected by Baron H. von Türckheim, mainly in the humid mountain region of Alta Verapaz. A large proportion of these, particularly of those first studied, were courteously forwarded for examination by Capt. John Donnell Smith, whose ferns, out of his entire herbarium presented to the Smithsonian Institution several years ago, have recently been incorporated in the U. S. National Herbarium. The other specimens, received directly from Baron von Türckheim, include a few not seen in Captain Smith's collection. Altogether, the plants are the most interesting series which it has been the writer's privilege to examine from any part of Central America, serving, as they do, to indicate a rather close relationship between the fern flora of eastern Guatemala and that of the similarly humid belt of eastern Mexico at mid-elevations—the latter a region not very adequately explored, at least for ferns, since Liebmann's time. Examples of this are found in the notable extension of range for *Diplazium ternatum*, known previously only from Oaxaca, Mexico, and in the additional material from Vera Cruz of several of the new species based upon Baron von Türckheim's specimens.

Another feature of interest is the rather large number of undescribed species now collected in the general region to which Baron von Türck-

[a] Forming part 7 and including pages 473–508, plates 60 and 61. March 30, 1908.

heim has given so much careful exploration in years past; yet this need not surprise one who has even a slight knowledge of the country. During January, 1905, the writer, while engaged in economic work affording little time for collecting, passed a few days upon the southern and eastern borders of this region, traveling by water from Port Livingston to Panzos, thence overland to Sepacuité, Secanquim, Senahú and Actalá, in Alta Verapaz; thence by way of Purulhá out of the humid districts to the interior arid basin of Salamá. The greater part of Alta Verapaz is a rough mountainous region of intense humidity, largely covered, except in the neighborhood of coffee plantations and Indian villages, by extensive forests, offering the most ideal conditions for a luxuriant growth of ferns, both as to species and number of individuals. The fern flora will be found eventually to be scarcely if at all inferior to that of Jamaica, long regarded as one of the richest in America. A thorough and extended survey of this region, rather difficult of accomplishment owing to the long-continued rains which render the few trails at times almost or quite impassable, in connection with a similar exploration of Oaxaca and Vera Cruz at mid-elevations, is, so far as the ferns are concerned, perhaps the most desirable or even necessary fieldwork that can be undertaken at present in tropical North America.

As to the specimens here listed, Baron von Türckheim's labels invariably supply full data as to locality and altitude, and commonly as to habitat; but not infrequently the same number is given to specimens supposed to be of the same species collected at different times, even in different years; hence, to avoid error the date of collection is cited for each specimen listed below, in addition to the number and locality. These data pertain only to specimens in the U. S. National Herbarium. A few of the common species which were received under their proper name and a few others which offer no points of particular interest are omitted. Also, to obviate unnecessary duplication of data for those listed, the province is omitted in the case of Coban and Cubilquitz, both of these being in Alta Verapaz.[a] All the numbers are of Baron von Türckheim's second series, as indicated by a roman II in each case.

## MARATTIACEAE.

**Danaea elliptica** Sm.

II. 491. Forests near Cubilquitz, altitude 350 meters, October, 1906.

A West Indian species, not reported from Mexico or Central America by Underwood.[b]

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[a] Since the following list was prepared for publication an additional package of specimens has been received from Captain Smith. A large part of these are Hymenophyllaceae, which are not included in the following enumeration. There are besides several numbers indicated by Doctor Christ as representing undescribed species.

[b] Bull. Torr. Club **29**: 672. 1902.

**Marattia weinmanniaefolia** Liebm.

II. 2094. Near Coban, altitude 1,600 meters, January, 1908.

Agreeing perfectly with a type specimen of Liebmann's in the U. S. National Herbarium, collected in forests between Donaguia and Roayaga, Oaxaca, at an altitude of from 1,200 to 1,500 meters.

No. II. 2094 was distributed as *M. alata*.

## SCHIZAEACEAE.

**Lygodium** sp.

II. 1695. Above Panzal, Baja Verapaz, altitude 1,300 meters, April, 1907.

## GLEICHENIACEAE.

**Dicranopteris fulva** (Desv.) Underw. Bull. Torr. Club **34:** 255. 1907.

*Mertensia fulva* Desv. Mém. Soc. Linn. Paris **6:** 201. 1827.

II. 1313. Coban, altitude 1,350 meters, August, 1907.

Distributed as *Gleichenia pubescens* H. B. K.

## CYATHEACEAE.

**Alsophila bicrenata** (Liebm.) Fourn.

II. 1454. Forest near Cubilquitz, altitude 350 meters, October, 1906.

II. 2088. Coban, altitude 1,350 meters, January, 1908.

Dissimilar as these two numbers appear to be at first glance, there is little doubt that they are forms of the same species. They have been carefully compared with a type specimen of *bicrenata* in the National Herbarium, collected by Liebmann in Oaxaca. No. II. 2088 agrees with this rather more closely than does no. II. 1454, differing, however, in having the segments a little closer and the veins mostly several times forked. But these seem to be characters due to its lesser degree of fertility, for where it is fertile the veins are mostly once forked, as in the type specimen and in no. II. 1454. The presence of bullate scales upon the costæ and costulæ, apparently a variable character, is more pronounced in II. 2088, in which this number agrees perfectly with the type specimen.

**Alsophila godmani** Hook.

II. 1655. Coban, altitude 1,550 meters, March, 1907.

The present specimen, which is from the type locality, represents an uncommonly fertile state of the species, having 5 or 6 pairs of sori to each segment; otherwise it is like Captain Smith's no. 1007, which answers perfectly to the original description, having but a single pair of sori to each segment. No. 1007 is said to have come from Pansamalá, altitude 1,200 meters, August, 1886; but some of the specimens have the original label reading "Im Walde bei Coban; 4600′; Jan., 1888."

The species is apparently a variable one and must be studied in comparison with *A. bicrenata* (Liebm.) Fourn., or at least with the specimens passing under that name.

**Alsophila salvinii** Hook.

II. 2027. Mountain forests near Coban, altitude 1,600 meters, December, 1907.

**Alsophila schiediana** Presl.

II. 1455. Forests near Cubilquitz, altitude 350 meters, October, 1906. (Received under the name *Alsophila bicrenata* Fourn.)

**Cibotium guatemalense** Reich. f.

II. 2113. Rio Frio, near Santa Cruz, Alta Verapaz, altitude 1,500 meters, February, 1908.

Captain Smith's no. 1505, collected at the same locality in April, 1889, is the same. Both were distributed as *Cibotium schiedii*.

**Cyathea delicatula** Maxon, sp. nov.

*Alsophila delicatula* Maxon, in sched.

Trunk and stipe wanting; fronds relatively small, about 80 cm. broad, delicate, very deeply tripinnatifid; primary rachis unarmed, slight, the under surface greenish yellow, minutely puberulo-furfuraceous, glabrescent, the upper surface brownish olivaceous and very densely strigose with jointed beadlike closely appressed brownish hairs; pinnæ alternate, the largest 43 cm. long, 10 or 11 cm. broad, sessile, lanceolate, acuminate, comprising about 30 pairs of straight linear-lanceolate membranous spaced pinnules; secondary rachis delicate, flattened in drying, this and the costa of the pinnules very densely strigose above like the main rachis, minutely glandular-pubescent below; pinnules 5.5 to 6 cm. long, 7.5 to 9 mm. broad, cut nearly to the costa into about 20 pairs of narrowly oblong nearly straight unequally rounded or subacute segments; segments 4 to 5 mm. long, about 2 mm. broad at the middle, the sinuses acute, the margins lightly crenate-serrulate in the outer part, the costulæ sparingly pubescent, bearing also numerous ovate acuminate bullate reddish brown scales; veins about 7 or 8 pairs to each segment, sometimes simple but mostly once forked at a slight angle, concealed, setulose; sori relatively large, 5 or 6 pairs, nearer the midvein than the margin, seated at the fork of the veins; indusium hyaline, very delicately membranous, bursting irregularly, evanescent, or the inferior portion subpersistent as a shallow scale; receptacle small, slightly elevated, hirsute.

Type in the U. S. National Herbarium, no. 826192, collected at the summit between Tactic and Coban, Alta Verapaz, Guatemala, at an altitude of 2,000 meters, by Baron H. von Türckheim, no. II. 1629, February, 1907.

*Cyathea delicatula*, which is known only from the type collection, appears to be without any very close allies. The most noteworthy features are its very narrow elongate spaced pinnules and the copious bullate scales covering the costa of the segments.

**Cyathea mexicana** Schlecht.

II. 2108. Forest near Coban, altitude 1,200 meters, February, 1908.

*Cyathea mexicana*, known hitherto only from Mexico, is represented by a fair series in the National Herbarium. The pinnules are uniformly at right angles and are readily separable from the secondary rachis.

**Cyathea tuerckheimii** Maxon, sp. nov.

Trunk and stipe wanting; fronds apparently ample, at least 130 cm. broad, very deeply tripinnatifid; primary rachis yellowish brown below, very densely furfuraceous with minute deciduous yellowish brown scales and armed with numerous short (1 to 1.5 mm.) straight erect spines, tuberculate and glabrate with age; pinnæ 65 cm. long, 25 cm. broad, petiolate (1.5 cm. or more), lanceolate, acuminate, the secondary rachis spinescent, clothed like the primary rachis; pinnules 11 or 12 cm. long, 1.7 to 2 cm. broad above the base, about 28 to 30 pairs below the deeply serrate apex, short-petiolate (the lower ones 4 or 5 mm.), contiguous, narrowly lanceolate, attenuate, borne at a right angle or those toward the base slightly retrorse, all very deeply serrate (nearly to the costa); costa of the pinnules yellowish brown with a few minute short hairs and numerous very caducous glossy dark brown ovate-lanceolate attenuate erose scales about 2 mm. long; segments about 20 to 22 pairs, narrow, 10 to 12 mm. long, 3 to 3.5 mm. broad, falcate, the basal ones separate, the others somewhat dilatate and connected by a narrow wing, the margins simply crenate-serrate, revolute in drying, especially toward the subacute apex, the costules clothed similarly to the costæ, but the scales lighter in color (yellowish brown), triangular-ovate, long-acuminate, somewhat bullate, with a few stout curved septate whitish hairs intermixed; veins of the segments about 10 or 11 pairs, forked near the base, elevated, glabrate; sori large, yellowish, 6 to 9 pairs, occupying two-thirds or more of the segment, seated at the forking of the veins, the receptacles conspicuous; indusia membranous, rupturing irregularly, subpersistent.

Type in the U. S. National Herbarium, no. 826195, collected near Coban, Alta Verapaz, Guatemala, altitude about 1,350 meters, by Baron H. von Türckheim, no. II. 1645, February, 1907. Other specimens as represented in the National Herbarium are: Baron von Türckheim's no. II. 2031, collected between Coban and Tactic, at an elevation of 2,000 meters, December, 1907; and no. 1238 of Captain Smith's distribution, collected near Coban by Baron von Türckheim in April, 1887, and distributed as *Cyathea arborea*. No. II. 2031 seems to be from the base of a frond and has the pinnæ fully 2.5 cm. petiolate.

The relationship of *C. tuerckheimii* is with the Costa Rican *C. subaspera* Christ. From this it differs in its narrowly lanceolate or even linear-lanceolate approximate pinnules (these never elongate-deltoid, as in *C. subaspera*), and in having the costa of the pinnules and segments densely scaly. *C. subaspera* in all its forms is well marked by its long-petiolate distant pinnules, which are only closely furfuraceous and never otherwise chaffy.

## POLYPODIACEAE.

### Tribe ACROSTICHEAE.

**Elaphoglossum catharinae** Underw. sp. nov. in herb.

Rhizome stoutish, 7 to 9 mm. in diameter, assurgent, clothed toward the summit with a few small sparingly denticulate linear-lanceolate long-attenuate yellowish brown scales; fronds rather numerous (10 to 14), loosely cespitose, 9 to 21 cm. long. Foliar fronds considerably exceeding the sporophyls; stipe slender, 3 to 8 cm. long, stramineous or somewhat greenish, reticulate, densely clothed with spreading yellowish brown scales, these linear-subulate from a broader base, the margins closely involute; lamina firmly membranaceous, linear-oblong, 8 to 15 cm. long, 1 to 2 cm. broad, abruptly acute at the base, the apex gradually attenuate, the surfaces and margins sparsely clothed like the stipe; veins distant, simple or rarely once forked, usually in the outer part, falling far short of the margin, the apices much enlarged. Sporophyls 7 to 12 cm. long; stipe 6 to 9 cm. long, similar to that of the foliar frond; lamina 2 to 3.5 cm. long, about 1 cm. broad, oblong-lanceolate, broadest above the abruptly acute base, acutish at the apex, with numerous linear-lanceolate glossy reddish brown minutely denticulate somewhat imbricate scales scattered over the lower surface among the sporangia.

Type in the U. S. National Herbarium, no. 50579, collected by Baron H. von Türckheim, from tree trunks at Pansamalá, Alta Verapaz, Guatemala, altitude 1,200 meters, in August, 1886, and distributed by Captain Smith as no. 1003. Baron von Türckheim's no. II. 1944, from Coban, Alta Verapaz, altitude 1,350 meters, August, 1905, is the same in less mature condition, the sporophyls not well developed and the foliar fronds rather young and more membranous than in the type. According to Doctor Underwood's notes, specimens of this species at Kew were collected at Chilasco, Guatemala, by Salvin and Godman.

**Elaphoglossum guatemalense** (Klotzsch) Moore.

II. 1859. Coban, altitude 1,350 meters, September, 1907. Epiphytic.

II. 1939. Coban, altitude 1,350 meters, August, 1907. Epiphytic.

The present specimens, referred here with some doubt, have both fertile and sterile fronds actually and relatively longer and narrower than in the typical form of the species. The blades of the sporophyls especially are of unusual length (20 cm.) and taper very gradually to an attenuate base. The stipes measure from 20 to 25 cm. in length.

Specimens from Cubilquitz, altitude 350 meters, collected by Baron von Türckheim (no. II. 890) and distributed by Captain Smith as no. 8635, are apparently more typical of the species.

**Elaphoglossum hirtum** (Sw.) C. Chr.

II. 1863. Near Coban, altitude 1,350 meters, August, 1907.

**Elaphoglossum hookerianum** Underw. nom. nov. in herb.

*Acrostichum muscosum* Jenman, Bull. Bot. Dept. Jamaica II. **5**: 88. 1898 (excluding reference to Plum. *pl. 126*), not *A. muscosum* Sw., 1788.

*Acrostichum muscosum β latifolium* Hook. Sp. Fil. **5**: 231. 1864.

II. 1862. Coban, altitude 1,350 meters, August, 1907.

The following additional numbers are in the U. S. National Herbarium:

JAMAICA: Various localities in the Blue Mountains, at altitudes of from 1,650 to 2,100 meters, on tree trunks of humid forested slopes, *W. Harris* 7518; *Underwood* 3212; *Maxon* 1302, 1454, 2667, 2696, 2715.

GUATEMALA: Trail from Senahú to Actalá, Alta Verapaz, on a fallen tree trunk, *Maxon & Hay* 3314.

This species was mistakenly described by Jenman under the name "*Acrostichum muscosum* Sw.," while the true *A. muscosum* of Swartz was described by him as *A. lepidotum* Willd., a South American species which apparently does not occur in Jamaica.[a]

The Jamaican and Guatemalan plants are identical. One of the most characteristic features is the large, upright rhizome, which attains a height of 10 to 12 cm. and a diameter of 2 cm. The long linear acuminate reddish-brown slender scales of the rhizome, mentioned by Jenman, are oftentimes obscured by the mass of large spreading tawny scales of the stipes. Associated with the large spreading scales of the stipe is a series of smaller scales, these closely appressed. The upper surface of the lamina becomes glabrous with age.

**Elaphoglossum longifolium** (Jacq.) J. Sm.

II. 1860. Coban, altitude 1,350 meters, August, 1907. Epiphytic.

**Elaphoglossum petiolatum** (Sw.) Urban.

II. 1943, in part. Coban, altitude 1,350 meters, September, 1907.

II. 1945. Coban, altitude 1,350 meters, August, 1907.

II. 2386. Coban, altitude 1,350 meters, June, 1908.

These specimens accord well with a considerable series of the typical Jamaican plant in the U. S. National Herbarium: *Maxon* 1323, 2648, 2668, 2717, *Clute* 312, these from various localities in the Blue Mountains, at an altitude of from 1,650 to 1,800 meters.

The second portion of no. II. 1943 is *E. rubescens*.

**Elaphoglossum rubescens** (Kuhn) Christ.

II. 1503. Coban, altitude 1,350 meters, September, 1906.

II. 1941. Coban, altitude 1,350 meters, August, 1907.

II. 1946. Coban, altitude 1,350 meters, August, 1907.

II. 1943, in part. Coban, altitude 1,350 meters, September, 1907.

Known only from Guatemala; represented in the U. S. National Herbarium by the following additional numbers, all from Alta Verapaz:

Trail between Sepacuité and Secanquim, altitude 550 to 900 meters, rocky bank at border of forest, *Maxon & Hay* 3120; on a tree trunk, *Maxon & Hay* 3235.

Secoyoté, near Senahú, on a decayed stump, *Maxon & Hay* 3247.

In size, shape, and vestiture the series of specimens cited show a wide range of variation, due mostly to varying habitat, age, and degree of maturity.

**Elaphoglossum tovarense** (Mett.) Moore.

II. 1858. Coban, altitude 1,350 meters, July, 1907. Epiphytic.

II. 1940. Coban, altitude 1,350 meters, August, 1907. Epiphytic.

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[a] *Acrostichum muscosum* Sw. was founded on Plumier's plate 139, but this figure is cited wrongly by Jenman as representing *A. lepidotum* Willd. Plate 126, cited by Jenman as illustrating *A. muscosum*, had never before been associated with that name; it represents a Martinique plant showing some resemblance to *E. hookerianum*, but probably not the same.

The type is from Colombia, but Mexican specimens from Mirador and Orizaba are also mentioned in the original diagnosis. A specimen collected recently on the island of Margarita, off Venezuela, *Johnston* 146, is the same.

The name has definite standing only from 1869, when the first description was published.

**Rhipidopteris peltata** (Sw.) Schott.

II. 1022. Coban, altitude 1,350 meters, October, 1907. On tree trunks in forest.

Tribe VITTARIEAE.

**Scoliosorus ensiformis** (Hook.) Moore.

II. 1694. Panzal, Baja Verapaz, altitude 1,000 meters. Epiphytic in forest.

Regarded by Benedict,[a] in his recent revision of the American species of Antrophyum, as constituting only a well-marked subgenus of Antrophyum; yet of very different appearance, and upon the several microscopic characters brought out (*i. e.*, spores diplanate, paraphyses present) differing from all the American species of Antrophyum.

Described originally from Mount Totontepeque, Mexico, and ranging from Mexico to Costa Rica. The synonymy is indicated by Benedict.

**Vittaria filifolia** Fée.

II. 1382. Coban, altitude 1,350 meters, November, 1907. Epiphytic, in forest.

II. 1689. Forests above Panzal, Baja Verapaz, altitude 1,500 meters, April, 1907.

Both numbers have been determined by Mr. R. C. Benedict.

Tribe POLYPODIEAE.

**Campyloneurum angustifolium** (Sw.) Fée.

II. 2349. Coban, altitude 1,350 meters, May, 1908.

**Campyloneurum tenuipes** Maxon, sp. nov.

Fronds 4 or 5, erect, loosely clustered near the apex of the prostrate rhizome, very long-stipitate, 40 to 60 cm. long; rhizome woody, creeping, 10 to 20 cm. long, 8 to 10 mm. in diameter, copiously rooting below, above densely tuberculate, toward the apex thickly covered with spreading deltoid-lanceolate attenuate dark brown scales 5 to 7 mm. long; stipe relatively slender, 2 to 3 mm. in diameter, light brownish, glabrous, deeply sulcate along the ventral face, angled in drying, 18 to 25 cm. long; lamina firmly chartaceous, 25 to 40 cm. long, 5 to 7 cm. broad, linear-lanceolate, gradually narrowed to an acute or acuminate base, the apex very abruptly long-acuminate, the midvein slender, yellowish brown below and a little elevated, the margins repand-undulate, cartilaginous, minutely revolute; main veins 45 to 55 pairs, diverging at an angle of about 75 degrees, the middle ones 5 to 8 mm. apart, stramineous, subequally elevated upon both surfaces, slightly flexuous, extending almost to the margin; areoles 7 or 8, excepting the basal ones commonly divided by a median excurrent veinlet, this discontinuous or continuous with that of the next areole, 2 rows of minor areoles thus formed, each of them with a single small sorus dorsal upon the short included veinlet, the sori thus irregularly biserial between the main veins.

Type in the U S. National Herbarium, no. 826269, collected from rocks in the forest near Coban, Alta Verapaz, Guatemala, altitude 1,350 meters, by Baron H. von Türckheim, no. II. 1952, September, 1907.

A remarkable species, combining to a considerable degree the characters of two very different groups. In venation it resembles *C. xalapense* of the same region rather closely, but differs widely in leaf form and especially in its long slender stipes, *C. xalapense* having short stipes and the lamina longer and narrower, gradually narrowed

[a] Bull. Torr. Club **34:** 445–458. 1907.

to an attenuate base, but at last abruptly cuneate; this last is one of the most distinctive marks of the species. In *C. tenuipes* the base of the lamina is evenly acute or acuminate to the end. In general leaf form and in its long slender stipes only, *C. tenuipes* resembles *C. sphenodes*, as understood by Doctor Christ, very closely; but from this it differs radically in venation and wholly in the characters of its rhizome, *C. sphenodes* having the areoles *not* divided by a secondary veinlet and the rhizome very slight (less than 2 mm. in diameter), sinuous and extensively creeping or climbing, essentially naked, and with the fronds widely spaced.

**Campyloneurum xalapense** Fée.

II. 1857. Coban, altitude 1,350 meters, June, 1907.

**Goniophlebium acuminatum** Fée, 11me Mém. Foug. 68. *pl. 19. f. 1.* 1866.

II. 1687. Panzal, Baja Verapaz, altitude 1,000 meters, April, 1907. Epiphytic.

The specimen referred here agrees well with Fée's plate and description. The tissue, though coriaceous, is uncommonly translucent; the veins are elevated. Known previously to the writer only from the West Indies, Guadeloupe, the type locality, and Jamaica (*Maxon* 1022, 1918).

**Goniophlebium ciliatum** (Willd.) J. Sm.; Hook. Gen. Fil. under *pl. 51.* 1840.

*Polypodium ciliatum* Willd. Sp. Pl. **5:** 144. 1810.

II. 125. Cubilquitz, altitude 350 meters, July, 1907. Epiphytic.

**Goniophlebium inaequale** (Moore) J. Sm. Cult. Ferns 3. 1857.

*Phlebodium inaequale* Moore, Gard. Chron. **1855:** 660. 1855, not *Polypodium inaequale* Ettingshausen, 1864, nor Fée, 1866.

*Polypodium guatemalense* Hook. Sp. Fil. **5:** 29. 1863, not Klotzsch, 1855.

*Polypodium lowei* C. Chr. Ind. Fil. 326. 1905; 541. 1906.

II. 1827. Coban, altitude 1,350 meters, June, 1907. Epiphytic, in forest.

Known only from Guatemala, where it is not uncommon; usually listed under the invalid name *Polypodium guatemalense* Hook. If retained under Polypodium, Christensen's name must be adopted. The venation is peculiar and is illustrated by Moore, plate 58, figure 4. The plant is essentially a Goniophlebium, however; and Moore's name, though invalid under Polypodium, is available under the genus Goniophlebium.

**Goniophlebium loriceum** (L.) J. Sm.

II. 2037. Coban, altitude 1,350 meters, December, 1907. Epiphytic, in forest.

**Goniophlebium sanctae-rosae** Maxon, sp. nov.

Fronds several, close or scarcely 1 cm. apart, rigidly erect, 25 to 65 cm. long; rhizome very firm, short-creeping, prostrate, copiously rooting below, 5 or 6 mm. in diameter, the fronds borne upon very pronounced knob-like protuberances 3 to 4 mm. high, the whole rhizome very closely covered with persistent wholly appressed roundish or subovate dark rusty scales less than 1 mm. long, these attached at their large blackish centers, the lighter margins delicately and minutely fimbriate; stipes stout, 2 to 3 mm. in diameter, 8 to 28 cm. long, dark or light brown beneath a dense chaffy covering similar to that of the rhizome, the scales longer, often long-attenuate, copiously, deeply, and evenly fimbriate, the cilia approximate and wide-spreading; lamina 17 to 35 cm. long, 5.5 to 15 cm. broad, oblong to broadly oblong-lanceolate, not reduced at the base, the apex usually very abruptly reduced with a conform or elongate terminal pinna, or, rarely, gradually reduced, the uppermost pinnæ 1 to 1.5 cm. long, the terminal segment nearly equal; rachis clothed below like the stipe, the scales mostly long-attenuate; pinnæ 14 to 38 pairs, straight, horizontal or slightly ascending, linear, entire, 2.5 to 8 cm. long, 5 to 7 mm. broad (appearing narrower from the narrowly involute margins), slightly dilatate at the base, mostly a little surcurrent, the upper ones also decurrent, their bases adjoining, the lower ones distinct, up to 1 cm. apart, their bases unequal, invariably surcurrent, horizontally

excised below; pinnæ very densely covered below with appressed imbricate tawny scales, these very long-attenuate from a small subovate fimbriate darker-centered base, wholly concealing the leaf-tissue, above hoary with scattered whitish ciliate scales, these filiform from a deeply stellate roundish base; venation distinctly and typically goniophlebioid, a single row of narrow oblique areoles upon either side of the slender blackish costa, deeply immersed and otherwise wholly concealed by the scales; sori small, inconspicuous, 20 to 30 or more pairs, inframedial, terminal upon the single included veinlets.

Type in the U. S. National Herbarium, no. 826189, collected from rocks and the trunks of oaks near Santa Rosa, Baja Verapaz, Guatemala, altitude about 1,600 meters, by Baron H. von Türckheim, no. II. 1607, December, 1906. Other specimens from the same locality sent later under the same number were gathered in March, 1908.

The present is only one of a considerable number of more or less closely allied tropical American species, several of them of rather wide distribution, and most of them commonly misundertsood. It is related to the Costa Rican *P. myriolepis* Christ, which has been most injudiciously reduced to *P. skinneri* Hook. The last, of which *P. bernouillii* Baker is a true synonym, was described and figured upon Guatemalan specimens and appears to extend only northward into Mexico. The distinctive characters of these and of several others, some of them as yet undescribed, will be indicated in the next paper of this series.

**Phlebodium pulvinatum** (Link) J. Sm.

II. 1881. Coban, altitude 1,350 meters, June, 1907.

**Polypodium biauritum** Maxon, sp. nov.

Fronds rigid, about 90 cm. long, borne about 1.5 cm. apart; rhizome repent, 8 to 10 mm. thick, covered closely with small triangular-ovate centrally attached yellowish scales, these dark brown at the short apex; stipe stout, 33 to 37 cm. long, about 2.5 mm. in diameter, yellowish to yellowish brown, glabrescent; lamina elongate triangular-ovate, about 60 cm. long, 34 to 36 cm. broad in the lower half, comprising about 25 pairs of patent simple, mostly subopposite, linear-ligulate pinnæ; lowermost pinnæ subcordate at the base, mostly free at the inferior basal margin and overlapping the rachis, partially adnate at the superior basal margin, the middle pinnæ slightly longer, partially adnate below, wholly so above, the upper pinnæ gradually reduced, adnate and somewhat dilatate at the base, finally forming a deeply serrate elongate caudate apex about 1 cm. long; characteristic pinnæ of the lower third of the lamina 16 to 20 cm. long, 15 to 18 mm. broad, dull greenish, translucent, fragile, papyraceo-herbaceous, broadest in the basal third, tapering thence very gradually toward the somewhat attenuate subacute apex, at the base usually more or less constricted (especially below) with a small rounded auricle both above and below, the margins otherwise irregularly, but invariably crenate, ciliate; rachis and upper surface of the midveins conspicuously pubescent with very close-set light yellowish jointed glandular hairs, the midvein below less noticeably pubescent, the veins glabrate; sori uniserial, superficial, about 45 to 50 pairs, considerably nearer the margin than the midvein, borne at the extremity of the first anterior branch of the dark mostly twice or thrice forked oblique evident veins.

Type in the U. S. National Herbarium, no. 826213, collected in the forest between Purulhá and Panzal, Baja Verapaz, Guatemala, at an altitude of 1,500 meters, by Baron H. von Türckheim, no. II. 1688, April, 1907. Imperfect specimens collected in the District of Córdoba, State of Vera Cruz, Mexico, by Hugo Fink (no. 70), are apparently a smaller state of the same species.

*Polypodium biauritum* has the free venation of the true Polypodiums, yet shows considerable resemblance to the species described by Hooker as *P.* (*Goniophlebium*) *plectolepis*. From this it is distinguished readily not only by venation, but also by its adnate pinnæ and by having the sori borne much nearer to the margin than to the costa, this last being an unusual feature.

**Polypodium christensenii** Maxon, sp. nov.

Fronds large, 1 to 1.2 meters long, densely glandular-pubescent throughout, borne singly, 2.5 cm. apart; rhizome firm, creeping, 8 mm. in diameter, very thickly covered with spreading ferruginous scales, these most numerous at the base of the stipe, 9 to 14 mm. long, narrowly ovate to ovate, long-acuminate, attached near their base, the margins subentire, involute in the long-attenuate apical portion; stipe about 33 cm. long, stout, 3 to 4 mm. in diameter, dark brown, densely glandular-pubescent, the upper face deeply sulcate; lamina herbaceous, about 85 cm. long, 35 to 40 cm. broad at or just above the base, lanceolate-deltoid, once pinnate throughout, the pinnæ (about 35 pairs) whitish glandular-pubescent upon both surfaces, more conspicuously so upon the upper; basal pair of pinnæ deflexed, distant, 17 to 19 cm. long, 17 mm. broad in the middle, slightly narrowed toward the adnate base, tapering gradually in the outer part to a subacute apex, the margins irregularly crenulate-serrulate; succeeding pinnæ similar, at least their width apart, subopposite, horizontal, fully adnate, slightly longer than the basal or not, those of the upper two-thirds of the lamina very gradually shorter and a little closer, slightly dilatate, but neither surcurrent nor decurrent, the sinuses wide and obtuse, the apex of the lamina deeply pinnatifid almost to the end; rachis and costæ densely glandular-pubescent, the latter elevated below; veins free, 45 to 48 pairs, dark-colored, 4 or mostly 5-forked, the branches divergent, glandular-pubescent like the costa, the leaf tissue also minutely glandular-pubescent below; sori superficial, 40 to 45 pairs, large, borne mostly upon the first anterior branches, casually also upon the first posterior and second anterior branches, thus imperfectly uniserial, inframedial.

Type in the U. S. National Herbarium, no. 591558, collected in the mountains near Coban, Alta Verapaz, Guatemala, at an elevation of 1,600 meters, by Baron H. von Türckheim, no. II. 2179, in March, 1908. Specimens long ago distributed by Captain Smith under no. 3263c, from San Miguel Uspantán, Quiché, Guatemala, altitude 1,800 meters, are the same.

Related to *P. biauritum*, above described, from which it differs not a little in its differently shaped lamina and pinnæ, its more freely branched veins, its more general pubescence, its different margins, and its attenuate, spreading chaff. In general appearance and marked pilosity it suggests rather *P. macrodon* Hook. (*P. legionarium* Baker) of the same region, a species invariably with sessile, deeply and regularly incised pinnæ and a long conform terminal segment. *P. christensenii* is one of the most distinct and probably the largest species of the subgenus Eupolypodium, as commonly understood; it is named in honor of Mr. Carl Christensen, of Copenhagen, in grateful appreciation of numerous courtesies extended to the writer.

**Polypodium cultratum** Willd.

II. 2034. Between Tactic and Coban, Alta Verapaz, altitude 1,800 meters, December, 1907. Epiphytic.

**Polypodium fallax** Cham. & Schlecht.

II. 85. Cubilquitz, altitude 350 meters, July, 1907. Epiphytic.

**Polypodium furfuraceum** Schlecht. & Cham.

II. 31. Cubilquitz, altitude 350 meters, July, 1907.

**Polypodium leucosticton** Kunze.

II. 1397. Coban, altitude 1,350 meters, October, 1907.

The synonymy and range of variation of this species has recently been given at some length by Hieronymus,[a] who cites numerous South American specimens. *Polypodium plebeium* variety *palmense* Christ.[b] is the same, as shown by a specimen from the type locality: La Palma, Costa Rica, altitude 1,450–1,550 meters, *Maxon* 449.

So far as the writer knows, the species has not been known hitherto from Guatemala.

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[a] Engler's Bot. Jahrb. **34:** 521, 522. 1904.

[b] Bull. Herb. Boiss. II. **5:** 4. 1905.

**Polypodium macrodon** Hook.

II. 1686. Panzal, Baja Verapaz, altitude 1,000 meters, April, 1907.

II. 1929. Coban, altitude 1,350 meters, September, 1907.

The type of this species is from the vicinity of Coban, from which locality specimens have been examined by the writer.[a] Considerable additional material has recently been received from Alta Verapaz.

**Polypodium minusculum** Maxon, sp. nov.

A small epiphytic plant with about 6 entire rigid stipitate deflexed spongiose-coriaceous fronds, 6 to 9.5 cm. long; rhizome erect, 1 cm. or less high, about 3 mm. in diameter, the crown clothed with numerous lanceolate yellowish brown scales 2 to 2.5 cm. long; stipe dull brownish, slender, wiry, less than 0.5 mm. in diameter, 2 to 3.5 cm. long, arcuate, thickly clothed with erect spreading reddish castaneous hairs about 1 to 1.5 mm. long; lamina light or yellowish green, 4 to 6 cm. long, about 0.8 to 1 cm. broad, oblanceolate, tapering in both directions, the apex obtuse or subacute, the base acutely cuneate, both surfaces and the margins ciliate, the hairs like those of the stipe but frequently longer, those of the surface sometimes attaining a length of 2 mm.; margins entire or rarely somewhat sinuate; midvein concealed, flexuose; veins 15 to 20 pairs, 4 or 5 times forked, wholly concealed in the spongiose tissue, but easily apparent by transmitted light, the tissue then very translucent; sori superficial, orbicular or broadly oval, ½ to nearly 1.5 mm. broad at maturity, borne usually at or near the end of both the superior and inferior basal branches (occasionally also upon the outer branches), thus disposed in two irregular lines, one on each side of the midvein and mostly nearer to this than to the margin.

Type in the U. S. National Herbarium, no. 579065, collected upon a tree trunk in mountains near Coban, Alta Verapaz, Guatemala, at an altitude of 1,600 meters, by Baron H. von Türckheim, no. II. 1987, November, 1907. Known only from this collection.

*P. minusculum* is a diminutive member of the group of *P. trifurcatum* and finds its nearest ally in the Jamaican *P. nesioticum*. From this it differs in its smaller stature, short oblanceolate laminæ, more general hairy covering, nearly or quite entire margins, concealed midvein, and in several less obvious characters.

**Polypodium plebeium** Cham. & Schlecht.

II. 1256. Coban, altitude 1,350 meters, June, 1907. Epiphytic.

**Polypodium polypodioides** (L.) A. S. Hitchc.

II. 2135. Coban, altitude 1,350 meters, February, 1908.

II. 2213. Sasis, Alta Verapaz, altitude 1,000 meters, May, 1908.

**Polypodium productum** Maxon, sp. nov.

A slender wiry plant, with numerous close-set very narrow elongate deeply arcuate simply pinnate fronds 20 to 35 cm. long; rhizome short-creeping, the apical portion exposed and thickly covered with numerous light brown iridescent lanceolate divergent scales 3 to 3.5 mm. long, the apices long-attenuate, filiform, fragile, the cells broad with greatly thickened blackish brown cell walls; stipe slender, about 0.5 mm. in diameter, 2 to 3.5 cm. long, dull light brownish, with a close hispid covering of jointed yellowish brown hairs, these mostly short, unequal, and irregularly spreading; lamina very narrow, strongly arcuate or sometimes recurved, 18 to 32 cm. long, 12 to 15 mm. broad, comprising about 90 to 100 or more pairs of membrano-coriaceous translucent spaced glabrous pinnæ, the 3 or 4 lowermost pairs evident only as very minute triangular prominences upon the dull blackish brown hispid or glabrous rachis, those above gradually (within a distance of 3 or 4 cm.) attaining the characteristic linear-oblong form, the upper pinnæ decreasing very gradually into a long regularly serrate

[a] Contr. Nat. Herb. **8**: 275. 1903.

produced apex; characteristic middle pinnæ 7 to 9 mm. long, about 1.5 mm. broad, spaced their own width, forming an acute angle of about 45° with the rachis, straight, linear-oblong with entire slightly reflexed margins, at the apex obtuse (sometimes subacute in drying), at the base fully adnate, slightly dilatate both above and below, with obtuse sinuses, the rachis not alate; midvein dark, evident below, nearly straight, with about 6 pairs of acute simple greenish mostly soriferous veins, the clavate apices reaching the upper surface and there evident as reddish brown medial dots; sori superficial, about 6 pairs, distinct, small, slightly nearer the midvein than the margin, near the end of the veins; sporangia glabrous; paraphyses or intermixed hairs none.

Type in the U. S. National Herbarium, no. 579,036, collected from tree trunks in the forest near Coban, Alta Verapaz, Guatemala, at an altitude of 1,350 meters, by Baron H. von Türckheim (no. II. 1347, in part), November, 1907. Mixed with this are specimens of what appears to be a form of *Polypodium rigens* Maxon, a species reported hitherto only from Jamaica. This is distinguished readily by its stouter rhizome, its more conspicuous, larger, more abundant and straighter chaff, its stouter stipes, these covered with long stiff reddish hairs, its broader and relatively shorter laminæ, usually long-caudate at the apex, and its opaque, broader, and more rounded pinnæ, these borne nearly at right angles to the rachis and reduced more abruptly at the base of the lamina.

*Polypodium productum* is known also from Baron von Türckheim's no. 53, in part, distributed by Captain Smith, from the same locality. Mixed with it, however, are plants of *P. rigens*, mentioned above, and of another species even less closely allied to *P. productum*, and apparently undescribed.

In relationship *P. productum* stands somewhat apart. It is not, strictly, a member of the *pilosissimum* group, *P. pilosissimum* itself being a species little collected and and not well understood. In size and general appearance *P. productum* bears a close resemblance to a species of an entirely different group, namely *P. jubiforme* Kaulf., from which it differs in its superficial sori, in its spaced, scarcely decurrent, and more fertile pinnæ (the sori not confined to the outer portion), and in numerous more technical characters.

**Polypodium rigens** Maxon.

II. 1347, in part. Coban, altitude 1,350 meters, November, 1907. Epiphytic.

Described originally from Jamaica and not hitherto reported from Central America.

**Polypodium suspensum** L.

II. 2270. Coban, altitude 1,600 meters, May, 1908.

**Polypodium trichomanoides** L.

II. 2383. Coban, altitude 1,350 meters, May, 1908.

**Xiphopteris serrulata** (Sw.) Kaulf.

II. 1261. Coban, altitude 1,350 meters, November, 1907. Epiphytic.

Tribe PTERIDEAE.

**Adiantum capillus-veneris** L.

II. 1681. Panzal, Baja Verapaz, altitude 1,000 meters, April, 1907. On rocks in small streams.

II. 2074. Under a waterfall between Tactic and Coban, Alta Verapaz, altitude 1,600 meters, December, 1907.

**Adiantum concinnum** H. & B.

II. 2075. Near San Cristobal, Alta Verapaz, altitude 1,400 meters, in moist, shady situations, December, 1907.

**Adiantum dolosum** Kunze.

II. 50. Cubilquitz, altitude 350 meters, July, 1907.

**Adiantum flexuosum** Hook.

II. 1191. Coban, altitude 1,350 meters, August, 1907; in crevices of rocks.

Received under the name *A. féei* Moore, a Mexican species from which it is quite distinct, as indicated by Christensen. Collected also on dryish banks in the region of pines and oaks near Purulhá, Baja Verapaz, Guatemala, *Maxon* 3371.

**Bommeria pedata** (Sw.) Fourn.

II. 2327. Patal, near Santa Rosa, Baja Verapaz, altitude 1,600 meters, July, 1908.

**Cheilanthes farinosa** Kaulf.

II. 1568. Near Tactic, Alta Verapaz, altitude 1,600 meters, February, 1908.

**Histiopteris incisa** (Thunb.) J. Sm.

II. 1535. Upon the height between Coban and Tactic, Alta Verapaz, altitude 2,000 meters, December, 1907, and March, 1908. Rare.

A widely distributed collective species, greatly in need of critical revision.

**Pellaea intramarginalis** (Kaulf.) J. Sm.

II. 2177. Near Santa Rosa, Baja Verapaz, altitude 1,600 meters, upon rocks, March, 1908.

**Pteris deflexa** Link.

II. 1560. Upon the height between Tactic and Coban, Alta Verapaz, altitude 2,000 meters, February, 1908.

Determined by Doctor Christ.

**Pteris mexicana** (Fée) Fourn.

II. 1235. Coban, altitude 1,350 meters, December, 1907.

Received as *P. pulchra* Schlecht.

**Pteris orizabae** Mart. & Gal.

II. 2109. Caucale, near Coban, altitude 1,200 meters, February, 1908.

Determined by Doctor Christ.

**Trismeria trifoliata** (L.) Fée.

II. 1277. Near Coban, altitude 1,350 meters, October, 1907.

## Tribe ASPLENIEAE.

**Asplenium cirrhatum** Rich.; Willd. Sp. Pl. **5**: 321. 1810.

II. 1675. Forests between Purulhá and Panzal, Baja Verapaz, altitude 1,500 meters, April, 1907.

II. 2030. At the highest elevation between Coban and Tactic, altitude 2,000 meters, December, 1907.

II. 2211. Sasis, Alta Verapaz, altitude 1,100 meters, May, 1908.

The bipinnatifid and tripinnatifid forms of the variable species known usually under the Linnæan name *Asplenium rhizophorum*, recently discussed elsewhere by the writer.[a] The typical simply pinnate form is from Guadeloupe.

**Asplenium conquisitum** Underw. & Maxon; Christ, Bull. Herb. Boiss. II. **7**: 270. 1907.

II. 1684. Epiphytic, in the forest above Panzal, Baja Verapaz, altitude 1,500 meters, April, 1907.

This species is known from Jamaica, Guatemala, and Costa Rica. See Contr. Nat. Herb. **10**: 488. 1908.

**Asplenium erectum** Bory.

II. 1853. Coban, altitude 1,350 meters, March, 1907.

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[a] Contr. Nat. Herb. **10**: 490, 491. 1908.

**Asplenium erosum** L. Syst. Nat. ed. 10. **2:** 1324. 1759.

II. 1208. Coban, altitude 1,350 meters, December, 1907.

The present specimens, received under the name *Asplenium auritum* Sw., represent one of the many forms usually referred to under the latter name. There can be no question that *Asplenium erosum*, the name given by Linnæus in 1759, is the earliest one applied to any form of this species.[a] The later synonymy is much confused.

**Asplenium falcinellum** Maxon, sp. nov.

Fronds several (4 to 6), fasciculate, erect or arching, 75 cm. long (maximum), simply pinnate; rhizome suberect, slender, with a few spreading yellowish brown linear long-attenuate scales at the crown; stipe 18 to 21 cm. long, dull brownish, firm, stout, terete or slightly sulcate; lamina chartaceo-coriaceous, about 55 cm. long, 25 to 30 cm. broad, once pinnate, ovate, comprising about 12 pairs of distant slightly ascending subopposite pinnæ and an enlarged conform terminal segment; pinnæ lanceolate, varying from nearly straight to falcate, decidedly petiolate, the margins entire but subundulate in drying, all except the uppermost 3 or 4 pairs nearly equal in size and form, the lowermost the largest, these 15 to 17 cm. long, 2.5 to 3 cm. broad, at the base long-petiolate (about 5 mm.), acutely and subequally cuneate, in the outer portion attenuate; succeeding pinnæ very gradually smaller, all petiolate, the ninth pair 13.5 cm. long, 2 cm. broad, the uppermost pair 9 cm. long, 1.5 cm. broad, the terminal segment conform, nearly 2 cm. broad, the lamina thus reduced rather abruptly toward the apex; sori about 15 to 19 pairs to each pinna, equidistant (2 to 3 mm.) from the margin and the midvein, 15 to 22 mm. long, straight or slightly curved, produced upon the successive anterior branches of the mostly thrice dichotomous veins; indusium elevated, firm, narrow, less than 1 mm. wide, persistent.

Type in the U. S. National Herbarium, no. 826251, collected near Cubilquitz, Alta Verapaz, Guatemala, altitude 350 meters, by Baron H. von Türckheim, no. II. 1910, August, 1907. A specimen collected by Baron von Türckheim (no. II. 857) at the same locality and distributed by Captain Smith under no. 8636 as *A. salicifolium*, is exactly the same. The species occurs also in Chiapas, Mexico, according to a specimen in the herbarium of the Missouri Botanical Garden, collected by J. N. Rovirosa.

*A. falcinellum* is a near ally of *A. integerrimum* Spreng., a West Indian species redescribed recently by the writer.[b] From this it differs in its suberect rhizome, inconspicuous chaff, subterete wiry and noncarnose vascular parts, more numerous and spaced pinnæ, harsher texture throughout, more numerous sori and nonalate rachis. *A. falcinellum* is said to be epiphytic.

**Asplenium fragrans** Sw.

II. 1311. Epiphytic, in forest near Coban, altitude 1,350 meters, July, 1907.

A finely dissected delicate lax form, not uncommon in Guatemala and very different from the typical Jamaican plant. Similar or reduced forms, mainly continental, are not infrequently determined under other names.

**Asplenium monanthes** L. Mant. **1:** 130. 1767.

*Asplenium monanthemum* L.; Murray, Syst. Veg. 933. 1784.

II. 1642. Mountains between Tactic and Coban, altitude 1,800 meters, February, 1907.

The specimens under this number include the forms described and illustrated by Fée upon Mexican material as *Asplenium leptophyllum* and *A. galeottii*. These and others from distant regions, as shown by a very large series of specimens examined, appear to be but variously fertile states of a single polymorphic species of the widest distribution. *A. monanthes* was founded upon South African specimens.

**Asplenium serra** L. & F.

II. 2085. Coban, altitude 1,350 meters, December, 1907.

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[a] See Underwood, Bull. Torr. Club **33:** 196. 1906.

[b] Contr. Nat. Herb. **10:** 477. 1908.

**Asplenium serratum** L.

II. 165. Cubilquitz, altitude 350 meters, July, 1907. Epiphytic.

**Asplenium tuerckheimii** Maxon, sp. nov.

Fronds few (3 or 4), 30 to 40 cm. long, long-stipitate, borne in a small crown; rhizome slender, erect or ascending, 2 to 4 cm. high, clothed with old stipe bases and bearing at the apex a few rigid lanceolate dark brown scales; stipe slight, arcuate or subflexuose, bilaterally compressed, greenish brown, lighter above, 16 to 25 cm. long; lamina once-pinnate, variable in shape, broadly oblong to orbicular, comprising 3 or 4 pairs of membranaceous subopposite pinnæ nearly equal in size, the uppermost pair terminal upon the rachis, a terminal (single) pinna thus wanting; characteristic pinnæ 8 to 10 cm. long, narrowly lanceolate, sessile, at the base narrowly and equally cuneate, falcate, broadest near or below the middle (about 1.5 cm. broad), unequally long-attenuate, the margins regularly crenate-serrate, the crenations long, shallow, somewhat appressed, entire or slightly indented in the middle; midvein stramineous, apparent upon both surfaces throughout; sori elongate, 5 to 8 mm. long, slightly curved, uniserial, about 9 to 12 pairs, equidistant, borne on the anterior branch of the mostly once-forked veins; indusia narrow, delicate, yellowish brown.

Type in the U. S. National Herbarium, no. 826200, collected in the forest at Panzál, Baja Verapaz, Guatemala, altitude 1,000 meters, by Baron H. von Türckheim, no. II. 1677, April, 1907. A second collection of this has since been made at Sasis, Alta Verapaz, 1,100 meters, May, 1908 (no. II. 2212).

The alliance of *A. tuerckheimii* is perhaps with *A. abscissum* Willd., though the relationship is by no means a close one. From this species it differs radically in its elongate long-attenuate spaced equal pinnæ, regular and less deeply serrate margins, and especially in the usual absence of a terminal pinna—the uppermost pair of pinnæ commonly surmounting the apex of the rachis, as in certain forms of Danaea. Some variation in this last particular is noted in two specimens from the District of Cordoba, State of Vera Cruz, Mexico (*H. Fink* 41 and 135), in the U. S. National Herbarium, which are otherwise the same; several of these bear an odd terminal pinna. No. 41 was distributed as *A. cultrifolium*.

**Asplenium** sp.

II. 1647. Coban, altitude 1,350 meters, February, 1907, and March, 1908.

Small plants closely allied to *Asplenium verecundum* Chapman,[a] a Florida species which occurs also in Cuba, and the South American *A. divaricatum* Kunze, figured by Kunze[b] some time after its original publication. In revising this group of closely allied species the Mexican forms listed by Fournier under the section Caenopteris must be considered. Sufficient material for this is lacking at present.

**Athyrium achilleifolium** (Mart. & Gal.) Fée.

II. 2198. Sasis, Alta Verapaz, altitude 1,100 meters, May, 1908.

**Blechnum blechnoides** (Lag.) C. Chr.

II. 1420. Forest near Cubilquitz, altitude 350 meters, September, 1906.

**Diplazium plantaginifolium** (L.) C. Chr.

II. 1431. Near Cubilquitz, altitude 350 meters, September, 1906.

**Diplazium prominulum** Maxon, sp. nov.

Fronds about 55 cm. long; stipes about 20 to 25 cm. long, stout, naked, yellowish, from an erect relatively slight rhizome 10 cm. or more high, this with age nearly naked as to chaff; lamina 30 to 35 cm. long, 15 to 18 cm. broad, exactly ovate, comprising about 10 to 12 pairs of lobed horizontal or slightly ascending pinnæ, the lowermost

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[a] Bull. Torr. Club **33**: 193. 1906.

[b] Die Farrnkr. **2**: 94. *pl. 139*. 1851.

opposite and petiolate, those above subopposite, finally alternate and sessile, the uppermost gradually and regularly reduced, adnate and decurrent, the apex of the frond acute and coarsely serrate; characteristic middle pinnæ similar to the lowermost but slightly longer, about 10 cm. long, 2.5 to 3.5 cm. broad, short-petiolate, oblong-lanceolate, nearly straight, at the base obtusely cuneate (usually) and lobed about one-half the distance to the midrib, the lobes triangular, rounded, slightly oblique, about 8 to 10 on either side, these gradually much shorter toward the apex, the margins of the outer portion of the pinnæ merely crenate-serrate, the apex subentire, acute; midvein of the pinnæ elevated, nearly 1 mm. broad, conspicuous, yellowish, with about 13 to 15 pairs of elevated freely branching yellowish veins; veinlets about 5 pairs to each of the veins of the lower and middle portions of the pinna, mostly simple, only the lowermost anterior one or two once-forked; sori strictly diplazioid, dark brown, elongate, the lowermost somewhat apart and longest, somewhat curved, the others shorter, all nearly equidistant (as to the length of the veins) or nearer the costa; indusia inconspicuous.

Type in the U. S. National Herbarium, no. 826206, collected in the forest between Purulhá and Panzál, Baja Verapaz, Guatemala, altitude 1,500 meters, by Baron H. von Türckheim, no. II. 1683, in April, 1907. No other specimens have been seen.

*Diplazium prominulum* is related to *D. subsilvaticum* Christ, *D. arboreum* (Willd.) Presl,[a] *D. aemulum* Underw. & Maxon, and *D. werckleanum* Christ. It resembles rather closely the true *D. arboreum*, from which it differs in its ovate (not triangular-ovate), coriaceous (not membranous) fronds, its simply acute (not elongate or caudate) less deeply lobed pinnæ, and its stout yellowish flexuose rachis and prominent veins.

**Diplazium ? ternatum** Liebm.

II. 1682. Forest above Panzal, Baja Verapaz, altitude 1,400 meters, April, 1907.

This is perhaps the most interesting fern of the collection. The type specimens are from Oaxaca, Mexico, and the species has been reported hitherto only from Mexico. The present specimens are truly ternate, but are very much larger and more deeply incised than those described by Liebmann and redescribed and figured by Hooker.[b]

The species was described by Liebmann as a doubtful Diplazium and was placed by Hooker in his section Anisogonium of Asplenium. The venation is unique in that the lowermost superior branch (from many of the lowermost veins) being once forked the forks unite subsequently to form an elliptical areole, this wholly or partially fertile, the resulting vein fertile only near the areole, parallel to the other branches, and excurrent to the margin. The lateral branches are frequently soriferous in the middle of the pinnæ, the sori extending sometimes nearly to the margin. This is shown in Hooker's figure.

Hooker describes the sori as asplenioid along the veins that form the areole, but diplazioid along the vein resulting from their union. Liebmann refers to them as "simple or bilateral." The Guatemalan specimens are only sparingly fertile and show hardly any truly diplazioid sori; the areoles are from 11 to 17 mm. long and are produced equally in sterile and fertile fronds.

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[a] DIPLAZIUM ARBOREUM (Willd.) Presl, Tent. Pterid. 114. 1836.
*Asplenium arboreum* Willd. Sp. Pl. **5**:320. 1810, not of recent authors.
*Asplenium shepherdii* Spreng. Nov. Act. **10**:231. *pl. 17. f. 5. 6.* 1821.
*Diplazium shepherdii* Link, Hort. Berol. **2**:70. 1833.

An examination of Willdenow's type specimen of *Asplenium arboreum* by Professor Underwood and a tracing of the same seen by the writer constitute the basis for joining the *A. arboreum* of Willdenow and *A. shepherdii* Spreng. Most of the specimens passing as *A. arboreum* are to be referred to *Diplazium semihastatum* (Kunze) C. Chr., a common West Indian species.

[b] Second Cent. Ferns *pl. 51.* 1861.

**Diplazium werckleanum** Christ.

II. 1680. Panzal, Baja Verapaz, altitude 1,000 meters, in forest, April, 1907.

II. 1310. Near Coban, altitude 1,350 meters, February, 1908.

Both specimens were received under the name *A. verapax* Donn.-Sm.

**Loxogramme salvinii** (Hook.) Maxon.

*Grammitis salvinii* Hook. Second Cent. Ferns *pl. 71*. 1861.

*Gymnogramme* (*Selliguea*) *salvinii* Hook. Sp. Fil. **5:** 157. 1864.

II. 2378. Coban, altitude 1,600 meters, June, 1908. Epiphytic.

In addition to this the following specimens from Alta Verapaz are in the National Herbarium:

Pansamalá, altitude 1,140 meters, *von Türckheim* (*J. D. S.* 962). Trail between Sepacuité and Secanquim, altitude about 1,000 meters, on tree trunks in humid forest, *Maxon & Hay* 3262. Trail from Esperanza to Purulhá, depending from partially shaded rocks, *Maxon & Hay* 3359.

Christensen regards this as referable to Fée's *Selliguea mexicana* of earlier date (*Polypodium mexicanam* C. Chr.), but Fée's description and figure are far from applying to the Guatemalan plant. The two species are of interest as being the only representatives of an otherwise exclusively Old World genus. The nonarticulate fronds are sufficient to exclude them from Polypodium, even in its widest sense.

**Stenochlaena latiuscula** Maxon, Contr. Nat. Herb. **10:** 502. 1908.

II. 1901. Epiphytic in forest near Cubilquitz, altitude 350 meters, August, 1907.

This species, the type of which is from Costa Rica, was known previously from Guatemala upon specimens distributed by Captain Smith under no. 1129. The present specimens have the fertile pinnæ narrower and up to 15 cm. long.

**Struthiopteris ensiformis** (Liebm.) Broadhurst, in herb.

*Lomaria ensiformis* Liebm. Vid. Selsk. Skr. V. **1:** 234. 1849.

*Blechnum ensiformis* C. Chr. Ind. Fil. 153. 1905.

II. 1693. Forests near Purulhá, Baja Verapaz, altitude 1,800 meters, April, 1907.

According to Christensen, known previously only from Mexico. The grounds for using the generic name Struthiopteris in this connection will be recapitulated by Miss Broadhurst in a forthcoming revision of the North American species usually placed under Lomaria.

**Woodwardia spinulosa** Mart. & Gal.

II. 1537. Mountains between Tactic and Coban, altitude 1,800 meters, December, 1907.

## Tribe DRYOPTERIDEAE.

**Dryopteris ampla** (H. & B.) Kuntze.

II. 2118. Near Coban, altitude 1,350 meters, March, 1908.

**Dryopteris formosa** (Fée) Maxon.

*Aspidium formosum* Fée, Gen. Fil. 296. 1850–1852, in part.

II. 1678. Forest between Purulhá and Panzal, Baja Verapaz, altitude 1,500 meters, April, 1907.

II. 1854. Mountain woods near Coban, altitude 1,600 meters, November, 1907.

The synonymy of the present species is much confused. The original *A. formosum* of Fée included two Mexican numbers and one from Cuba. Later, and upon the same specimens, Fée divided the species into two, separating the Cuban and one of the Mexican plants under the name *Aspidium jucundum*.[a] Thus, by elimination, the name *formosum* attaches to the remaining Mexican plant, a species which ranges

[a] Fée, 10me Mém. 41. *pl. 42. f. 1.* 1865.

southward to Costa Rica, as evidenced by the following specimens in the U. S. National Herbarium:

MEXICO: District of Cordoba, State of Vera Cruz, *Fink* 33a.

GUATEMALA: San Miguel Uspantán, Department of Quiché, altitude 1,800 meters, *Heyde & Lux* (*J. D. S.* 3243). Forest near Tactic, Alta Verapaz, *von Türckheim*, December, 1879 (without number).

COSTA RICA: Estrella, Province of Cartago, altitude 1,320 meters, *Cooper*. Mountains 5 miles south of Cartago, altitude about 1,800 meters, *Maxon* 515. Forêts de l'Achiote, volcan de Poas, altitude 2,200 meters, *Tonduz* 10698. Without exact locality, *Cooper; Werckle*.

With regard to the *Aspidium jucundum* of Fée mentioned above, it is not stated whether this was figured from the Cuban or the supposed Mexican element; presumably upon the Cuban, however, for the plate and description agree well with the Cuban plant described afterwards by Mettenius[a] as *Aspidium cubense*, with Wright's no. 1099 as type, and no Mexican specimens similar to this have been seen. It may be noted that the alliance of these, as well as of Fée's *A. gracilipes* and *A. tenerum*, both Brazilian, is with *Dryopteris denticulata* (Sw.) Kuntze.

**Dryopteris lanceolata** (Baker) Kuntze.

II. 839. Cubilquitz, altitude 350 meters, July, 1907.

II. 1620. Coban, altitude 1,350 meters, January, 1907.

II. 1621. Near Coban, altitude 1,600 meters, February, 1908.

The first two specimens cited above were distributed under the name *Nephrodium salvinii* Baker. The species is known only from Guatemala. Other specimens, all from the province of Alta Verapaz, are:

Pansamalá, altitude 1,140 meters, *von Türckheim* (*J. D. S.* 626; distributed as *Nephrodium hirtum;* identification changed later to *N. salvini* Baker.). Pansamalá, altitude 1,140 meters, *John Donnell Smith* 1563 (distributed as *N. salvini*). Cubilquitz, altitude 350 meters, *von Türckheim* (*J. D. S.* 8647). Senahú, *Cook & Griggs* 482.

**Dryopteris longicaudata** (Liebm.) Maxon.

*Polypodium longicaudatum* Liebm. Vid. Selsk. Skr. V. **1:** 209. 1849.

II. 1691. High forest near Purulhá, altitude 1,800 meters, April, 1907.

The specimens accord perfectly with Liebmann's very full description and agree also with the following in the U. S. National Herbarium:

MEXICO: District of Cordoba, State of Vera Cruz, *Fink* 67½.

GUATEMALA: Near the Finca Sepacuité, Alta Verapaz, *Cook & Griggs* 178; 613.

This species is of the group of *Dryopteris rotundata* (Willd.) C. Chr., a species founded upon Plumier's plate 38, representing a Martinique plant. To this are referred also by Christensen *Polypodium flavopunctatum* Kaulf., founded upon Martinique and Montserrat plants, and *Nephrodium imrayanum* Hook., originally from Dominica. All three were kept distinct by Hooker, yet are closely related, and perhaps are only extreme forms of a single highly variable species. The Mexican and Guatemalan plant is notable for the narrow and long-decurrent bases of the pinnæ, the rachis being alate throughout, only the lowermost pinnæ free and long-cuneate.

The sori are nonindusiate, and the veins are normally quite free. In the Fink specimen, however, the lowermost pair of veins is joined casually, the resulting vein sometimes irregularly short-excurrent.

**Dryopteris mollis** (Fée) Maxon.

*Goniopteris mollis* Fée, Gen. Fil. 252. 1850–1852; Fée, Hist. Foug. Antill. 66. *pl. 24. f. 1.* 1866.

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[a] Linnaea **36:** 108. 1869.

*Polypodium ghiesbreghtii* Linden, Cat. 18. 1858.
*Polypodium crenatum β ghiesbreghtii* Hook. Sp. Fil. **5:** 3. 1864.
*Dryopteris ghiesbreghtii* C. Chr. Ind. Fil. 267. 1905.
II. 876. Cubilquitz, altitude 350 meters, July, 1907.

The *Goniopteris mollis* of Fée was founded upon Linden's no. 1499, from Tabasco, southern Mexico, and was figured by Fée several years later, at which time Fée mentioned having received a living plant from Amsterdam as "*Goniopteris ghiesbrechtii*" which he regarded as true *mollis*. Linden's plant also reached Hooker, who figured it in his Exotic Ferns, plate 84, 1859, merely as *Polypodium crenatum*. In 1864, however, Hooker recognized the Mexican plant as entitled to varietal rank, as noted above, citing Linden's no. 1499; and since then it has usually been regarded as a distinct species, mostly under the name *ghiesbreghtii*. Thus Baker recognized it in the Synopsis Filicum as distinct and later [a] referred here Captain Smith's no. 1407 from Alta Verapaz.

The species is subject to considerable variation in nearly all characters, depending mainly upon age and maturity. The sori are commonly rather small, perhaps only so with age, and slightly nearer to the midvein than to the vein excurrent from the point of union of the connivent veins. In this particular Fée's figure is better than Hooker's; but the margins are shown better by Hooker, and the lobes are not infrequently even more pronounced and irregular. The rachis and the under surface, even including the leaf tissue between the veins, are very densely villous, and the upper surface is somewhat scabrous with similar but stiffer hairs, these few and mostly confined to the veins. The pinnæ are subject to rather more variation in shape than in *D. poiteana* (Bory) Urban (the *Polypodium crenatum* of Swartz, Baker, and Jenman) and sometimes attain a considerable size, as in the present specimens of Baron von Türckheim's (30 cm. long, 6.5 cm. broad). They seem never to be bulbiferous at the base, as is usually the case in West Indian specimens of *D. poiteana*.

The following specimens have been examined:

MEXICO: Tabasco, *Linden* 1499 (a fragment).

GUATEMALA: Department of Alta Verapaz: Near the Finca Sepacuité, *Cook & Griggs* 281; 664. Near Secanquim, altitude 550 meters, *Maxon & Hay* 3132. Cubilquitz, altitude 350 meters, *von Türckheim* (*J. D. S.* 8648). Socolal, altitude 900 meters, *von Türckheim* (*J. D. S.* 1407). Chamiquin, altitude 360 meters, *von Türckheim* 550.

COSTA RICA: Without locality, *Werckle* (*ex herb. Christ*). Port Limon, at sea level, *Cook & Doyle* 419. Rio Hondo, Plains of Santa Clara, altitude 100 meters, *Cook & Doyle* 496.

**Dryopteris paucipinnata** (Donn. Sm.) Maxon.
*Nephrodium fendleri* var. *paucipinnatum* Donn. Sm. Bot. Gaz. **12:** 134. 1887.
*Dryopteris donnell-smithii* Maxon, in sched.

Rhizome horizontally creeping or ascending, woody, about 1.5 cm. in diameter, bearing at the apex a thick tuft of lanceolate to ovate attenuate concolorous dark-brown scales 7 to 9 mm. in length; fronds 2 or 3, approximate, glabrous, long-stipitate, 100 to 115 cm. in length; stipes about 65 cm. long, irregularly sulcate, greenish stramineous, naked except for a few deciduous scales at the base; lamina 40 to 50 cm. long, about 25 cm. broad, comprising 5 or 6 pairs of falcate elongate ascending lateral pinnæ and a conform terminal pinna, all nearly equal in dimensions, the upper ones slightly smaller; pinnæ 20 to 25 cm. long, broadest (about 3 cm.) in the middle, narrowly lanceolate, falcate, obliquely pinnatifid about one-third (or slightly more) the distance to the costa, tapering gradually to a narrow entire long-caudate apex, at the base acutely, narrowly, and subequally long-cuneate, short-petiolate; main lobes of

[a] Ann. Bot. **5**: 460. 1891.

the pinnæ about 20 pairs, approximate, subfalcate, triangular-ovate, unequally subacute in drying, with 10 to 14 pairs of simple excurrent veinlets, the 4 or 5 lowermost pairs extending to the narrow sinus, there falsely connivent by a translucent membrane; sori large, borne toward the extremity of the once-soriferous veinlets, there confluent with age, forming a conspicuous submarginal band around the lobe and extending beyond the sinus nearly to the costa; indusia whitish, reniform, inconspicuous, greatly reduced but persistent.

Described originally by Captain Smith upon his numbers 767 and 667, collected by Baron H. von Türckheim in Alta Verapaz, Guatemala; of these no. 767 may be designated as the type. Captain Smith's no. 1556, from the same region, is the same. The best examples, however, are specimens collected by Baron von Türckheim during 1907 near Panzal, Baja Verapaz, Guatemala, and distributed as no. II. 1690.

*Dryopteris paucipinnata* is related to the South American *D. fendleri* (D. C. Eaton) Kuntze, founded on Fendler's no. 372, from Tovar, Venezuela. From this, as determined by an examination of the type specimens in the Eaton Herbarium, courteously lent by Professor Evans, it differs conspicuously in its very slender stramineous scarcely chaffy stipes and in its few spaced mostly alternate and narrowly long-cuneate pinnæ, these having the segments more acute and at a smaller angle to the midvein and the sori borne very much closer to the margin. The most striking feature lies in the scant and open appearance of the frond, this due to the distant pinnæ being greatly narrowed at the base. Superficially only, the plant has on this account considerable resemblance to *D. obliterata* (Sw.) C. Chr.

**Dryopteris radicans** (L.) Maxon, Contr. Nat. Herb. **10**: 490, 491. 1908.

II. 1679. Panzal, Baja Verapaz, altitude 1,200 meters, on rocks, April, 1907.

The synonymy of this species has recently been given in full by the writer (loc. cit.).

**Dryopteris pterifolia** (Mett.) Kuntze.

II. 2181. Near Coban, altitude 1,350 meters, March, 1908.

Determined by Mr. Christensen, who will shortly publish upon it elsewhere.

**Dryopteris tuerckheimii** (Donn. Sm.) C. Chr.

II. 1200. Coban, altitude 1,350 meters, January, 1907.

Known only from Guatemala; noteworthy for the dense paleaceous covering of the deeply channeled stipe and rachis.

**Olfersia cervina** (L.) Kunze.

II. 418. Cubilquitz, altitude 350 meters, July, 1907.

Specimens collected in previous years by Baron von Türckheim at this same locality (*J. D. S.* 8044 and 8484), also *Cook & Doyle* 567 from Sepacuité, Alta Verapaz, and the only British Honduras specimen seen (leg. *Blaucaneaux*), agree in their very wide pinnæ and are rather different from the typical West Indian form.

**Phanerophlebia remotispora** Fourn.

II. 1856. Coban, altitude 1,350 meters, June, 1907.

**Poikilopteris donnell-smithii** (Christ) Maxon.

*Gymnopteris donnell-smithii* Christ, Bull. Herb. Boiss. II. **6**: 289. 1906.

II. 1492. Cubilquitz, altitude 350 meters, August, 1907. Epiphytic.

The use of this generic name has been discussed by Doctor Underwood.[a]

**Polybotrya caudata** Kunze.

II. 148. Cubilquitz, altitude 350 meters, July, 1907.

Received as *P. osmundacea*. Doctor Christ has recently published upon the several related species of this genus.[b]

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[a] Bull. Torr. Club **33**: 603–605. 1907.

[b] Bull. Herb. Boiss. II. **6**: 166–168. 1906.

**Polystichum** sp.

II. 1692. Near Purulhá, Baja Verapaz, altitude 1,800 meters, April, 1907.

**Polystichum** sp.

II. 1696. Coban, altitude 1,350 meters, May, 1907.

This and the preceding number are of the variable and difficult group of *P. aculeatum*, of which there are many described forms in Mexico and the American Tropics generally. Except with very adequate material not now at hand, it is impossible, in the absence of type specimens of the earlier and often imperfectly described species, to distinguish these properly.

Tribe DAVALLIEAE.

**Dennstaedtia adiantoides** (H. & B.) Moore.

II. 424. Cubilquitz, altitude 350 meters, July, 1907.

Received as *Dennstaedtia apiifolia* (Hook.) Moore. Captain Smith's 8047 from the same locality is the same.

**Dennstaedtia cicutaria** (Sw.) Moore.

II. 2376. Coban, altitude 1,550 meters, June, 1908.

**Dennstaedtia** sp.

II. 1328. Coban, altitude 1,350 meters, November, 1907.

Received under the name *Hypolepis repens*. A species of Dennstaedtia, allied to *D. exaltata* (Kunze) Hieron. and probably undescribed. It is matched exactly by the following specimens in the U. S. National Herbarium, all from Mexico: District of Cordoba, Vera Cruz, *H. Fink* 14 (several sheets). Valley of Cordoba, February 24, 1866, *Bourgeau* 1941. Region of Orizaba, June 9, 1866, *Bourgeau* 2342.

The last number is cited by Lindman[a] under *Dennstaedtia tenera*, a reference which seems to the writer incorrect.

**Dictyoxiphium panamense** Hook.

II. 54. Cubilquitz, altitude 350 meters, July, 1907.

**Nephrolepis biserrata** (Sw.) Schott.

II. 480. Cubilquitz, altitude 350 meters, July, 1907.

**Saccaloma inaequale** (Kunze) Mett.?

II. 2026. Forest near Coban, altitude 1,600 meters, November, 1907.

One of the forms included under this name; recently described as var. *dimorphum* Christ.

## HYMENOPHYLLACEAE.

**Hymenophyllum asplenioides** Sw.

II. 1894. Near Coban, altitude 1,550 meters, August, 1907.

**Hymenophyllum lanatum** Fée.

II. 1938. Coban, altitude 1,350 meters, August, 1907.

**Hymenophyllum microcarpum** Desv.

II. 1984 and II. 1985. Near Coban, altitude 1,600 meters, November, 1907.

**Hymenophyllum pannosum** Christ.

II. 1569. At the highest elevation between Coban and Tactic, Alta Verapaz, altitude 2,000 meters, December, 1907.

II. 1936. Upon a tree trunk near San Juan de Chameleo, Alta Verapaz, altitude 1,800 meters, September, 1907.

**Hymenophyllum polyanthos** Sw.

II. 1903. Near Coban, altitude 1,350 meters, August, 1907.

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[a] Ark. Bot. **1**: 194. 1903.

**Trichomanes capillaceum** L. Sp. Pl. **2:** 1099. 1753.

*Trichomanes tenellum* Hedw. Fil. Gen. & Sp. [text] *pl. 3. f. 1.* 1799.[a]

*Trichomanes trichoideum* Sw. Schrad. Journ. Bot. **1800** [2]: 98. 1801[b]; Sw. Syn. Fil. 144. 1806; Hook. & Grev. Ic. Fil. **2:** *pl. 199.* 1831.

*Trichomanes trichoides* Sw. Fl. Ind. Occ. **3:** 1741. 1806.

*Trichomanes angustissimum* Presl, Abh. Böhm. Gesell. Wiss. V. **5:** 333. 1848.

II. 1676. On trunks of *Alsophila* sp., in the forest between Purulhá and Panzal, Baja Verapaz, altitude 1,500 meters, April, 1907.

A common species throughout a large part of tropical America, growing usually upon the trunks of tree ferns. The synonymy has recently been indicated somewhat imperfectly by Hieronymus,[c] who adopts the name *T. trichoides* Sw., 1806, altogether disregarding *T. tenellum* Hedw., 1799, and citing *T. trichoideum* Sw. as from 1806 rather than 1801. The Linnæan name *capillaceum*, founded upon Plumier's plate 99, figure D, representing Santo Domingo plants, is regarded by Hieronymus as of too doubtful application to warrant its being adopted for the species accurately described later by Swartz. While it must be admitted that the figure of Plumier is incorrect in details, its general facies, together with the accompanying text, leaves little doubt as to its identity with the well known form. If, however, the Linnæan name *capillaceum* is to be discarded as too uncertain, the claim of *T. tenellum* must be considered. This is identical with *T. trichoideum* Sw., over which it has two years priority of publication.[b]

The synonymy of the form figured by Schkuhr as *T. cuneiforme*, and including *T. schiedianum* C. Müll., is given in full by Hieronymus. This form is reduced to *T. capillaceum* by Christensen, perhaps rightly.

**Trichomanes crispum** L.

II. 1846. Coban, altitude 1,350 meters, May, 1907.

**Trichomanes pyxidiferum** L.

II. 1463. Near Cubilquitz, altitude 350 meters, October, 1906.

**Trichomanes rigidum** Sw.

II. 1685. On moist earth in forest above Panzal, Baja Verapaz, altitude 1,500 meters, April, 1907.

Distributed as *T. mandioccanum* Raddi.

**Trichomanes rupestre** (Raddi) v. d. B.

II. 354. Near Cubilquitz, altitude 350 meters, October, 1906.

## EQUISETACEAE.

**Equisetum giganteum** L.?

II. 1990. Near Coban, altitude 1,350 meters, November, 1907.

## LYCOPODIACEAE.

**Lycopodium clavatum** L.

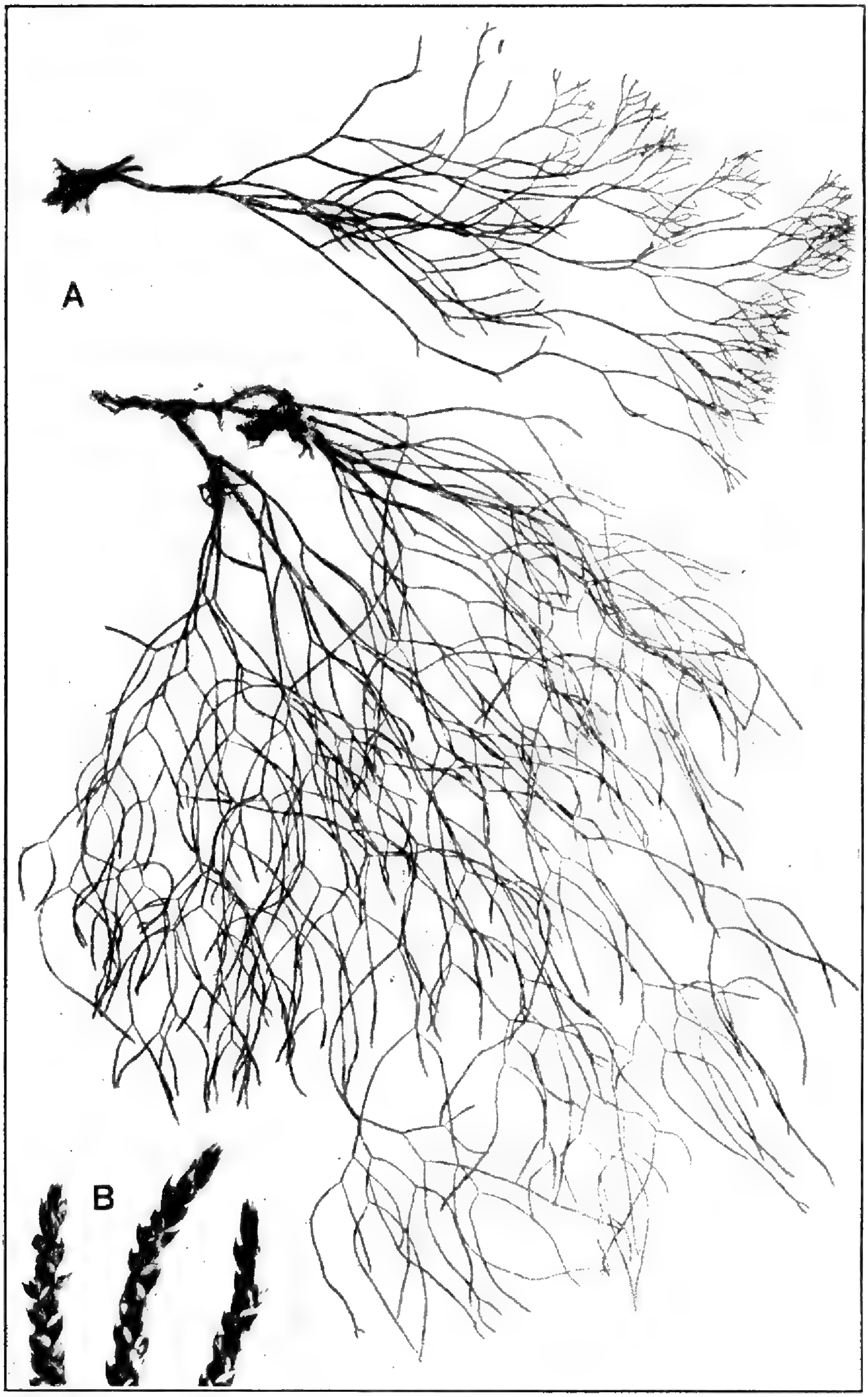
II. 2095. In moist, shady situations near Coban, altitude 1,600 meters, March, 1908.

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[a] The copy of this work in the U. S. National Museum has the plates unnumbered, this plate being bound as the sixth in order.

[b] At the end of the brief diagnosis of *T. trichoideum* in Schrader's Journal, Swartz, by a lapse of the pen, cites as a synonym, *T. pusillum*, his own species of 1788, which had been illustrated by Hedwig alongside *T. tenellum*. In the Synopsis Filicum, 1806, he attempted to "correct" the error by substituting, as a synonym of *T. trichoideum*, *T. tenellum*, which rather should supersede *T. trichoideum*, if the Linnæan name *capillaceum* is to be dropped.

[c] Engler's Bot. Jahrb. **34:** 424, 425. 1905.




LYCOPODIUM TUERCKHEIMII MAXON.

**Lycopodium reflexum** Lam.

II. 1355. Tactic, Alta Verapaz, altitude 1,600 meters, December, 1907.

**Lycopodium tuerckheimii** Maxon, sp. nov. PLATE 1.

Plants epiphytic, pendent, up to 38 cm. long, repeatedly dichotomous, the divisions widely divaricate, very slender, of nearly uniform thickness (1 to 1.5 mm.); leaves light or yellowish green, linear, subulate, appressed and strongly incurved, concave, about 6-ranked, those of the lower branches 3.5 to 4.5 mm. long, of the upper part gradually shorter and, with the gradual development of sporangia, broader at the base; strobiles scarcely or not interrupted, constituting the freely dichotomous terminal branchlets to a distance of 10 cm. or more; sporophyls of the ultimate branchlets crowded, rigid, achene-like, deltoid-ovate, acuminate, strongly carinate, about 1.3 mm. long, exceeding the sporangia only by the slender beak; sporangia orbicular, measuring about 9 mm. each way, at maturity invariably protruding beyond the margins of the sporophyls.

Type in the U. S. National Herbarium, no. 826246, collected upon tree trunks at an altitude of about 1,500 meters in the forest near Coban, Alta Verapaz, Guatemala, by Baron H. von Türckheim (no. II. 1864), January, 1908. Two earlier collections at the same locality, both by Baron von Türckheim, as represented by specimens in the National Herbarium, are: (1) Plants distributed by C. Keck under no. 208, and (2) others distributed by Captain Smith under no. 956B. The former are perfectly characteristic of the species and agree closely with the type collection; the latter represent a young state, but may safely be placed here. Both were under the name *L. verticillatum* var. *filiforme* Spring.

The alliance of *L. tuerckheimii* is with *L. pringlei* Underw. & Lloyd,[a] a Mexican species recently described. From this it differs very constantly in its delicate slender parts, its very numerous and widely divaricate branches, and its slender cord-like usually uninterrupted strobiles, these being about one-half the diameter of those of *L. pringlei*.

EXPLANATION OF PLATE 1.—Fig. *a*, the type specimen; *b*, fertile tips of same. Fig. *a*, scale about ½; *b*, scale 3.

## SELAGINELLACEAE.

**Selaginella cuspidata** Link.

II. 1386. Tactic, altitude 1,600 meters, December, 1907.

**Selaginella** sp. ined., Hieron. in litt.

II. 2114. Near Coban, altitude 1,500 meters, February, 1908.

**Selaginella bulbifera** Baker.

II. 2036. Moist forests near Coban, altitude 1,400 meters, December, 1907.

Determined by Dr. G. Hieronymus.

## THE BIPINNATE SPECIES OF CYATHEA.

During the course of field work in Cuba and Jamaica the writer has been fortunate in collecting all four of the undoubtedly bipinnate species of Cyathea previously described. As these have been and still are more or less misunderstood, one of them (*C. minor*) being referred even at present to a large tripinnate species, it has seemed desirable, in describing a new species of this alliance, to present a key by which these may be distinguished. Full descriptions will be published shortly in another connection.

[a] Bull. Torr. Club **33**: 109. 1906.

*Cyathea nockii*, of the high mountains of Jamaica, is at once the smallest and the most peculiar member of the genus. The short trunk never rises from the ground, and the coriaceous shining fronds, rarely more than a meter in length, resemble strikingly those of some coarse Dryopteris or Polystichum. This is the species which Mr. Baker has referred to *C. arborea*, a noble lowland species 5 to 12 meters high, with a wide-spreading crown of numerous fronds 2 to 4 meters long.

*Cyathea balanocarpa* and *C. pubescens* are also high mountain forms, with thick trunks attaining a height of from 3 to 12 meters, crowned with numerous erect or erect-arching fronds. *C. minor* is a Cuban species with a very slender caudex and few spreading fronds, these short-stipitate, the blade very greatly reduced at the base, the segments mostly adnate. Allied to the last, which is apparently rare, is the new species here described from Cuba, well marked by its short, horizontal, and mostly hypogean stem, long-stipitate fronds, and distinctly stalked segments. It is dedicated with pleasure to Mr. Theodore Brooks, of Guantanamo, Cuba, through whose courtesy and kindly help the writer was enabled to pass several weeks very profitably in 1907 in the region of the Yateras in eastern Cuba, an interesting territory best known from Wright's classic explorations of nearly fifty years ago and since then scarcely touched except by Baron Eggers.

KEY TO THE SPECIES.

Caudex procumbent, short, 10 to 40 cm. long.
- Fronds nearly or quite exstipitate; segments mostly adnate, coriaceous ..... 1. *C. nockii.*
- Fronds long-stipitate; segments mostly short-stalked, chartaceous ..... 2. *C. brooksii.*

Caudex erect, elongate, 2 to 12 meters long.
- Caudex slender, 2.5 to 3.5 cm. in diameter; lamina long-attenuate below ..... 3. *C. minor.*
- Caudex stout, 8 to 20 cm. in diameter; lamina more abruptly reduced below.
  - Primary rachis pubescent or hirsute; segments close, adnate; costæ conspicuously pilose below ..... 4. *C. pubescens.*
  - Primary rachis furfuraceous; segments spaced, mostly auriculate; costæ both paleaceous and pilose ..... 5. *C. balanocarpa.*

1. **Cyathea nockii** Jenm. Journ. Bot. **17**: 257. 1879.

TYPE LOCALITY: Bellevue, Jamaica, *Nock & Jenman.*

DISTRIBUTION: Confined to the Blue Mountains of Jamaica; not uncommon upon the steep forested slopes near Vinegar Hill, altitude, 1,000 to 1,200 meters (*Maxon* 2791); also below Cinchina.

2. **Cyathea brooksii** Maxon, sp. nov.

Caudex horizontal, mostly subterranean, about 40 cm. long, 3 cm. in diameter, emitting a few coarse cord-like roots below; fronds few (2 or 3), long-stipitate, erect-arching, 125 cm. or more long; stipe 35 to 40 cm. long, brownish, clothed at the base with a few linear-lanceolate opaque dark-brown scales less than 1 cm. long, above dull

yellowish brown, minutely furfuraceo-pubescent, sparingly fibrillose with long tortuous linear dark-brown scales, the rachis similarly fibrillose throughout; lamina lanceolate, fully bipinnate, about 90 cm. long, 30 to 38 cm. broad in the middle, tapering in both directions, the apex acute, the base somewhat reduced; pinnæ about 40 pairs, nearly horizontal, sessile, the middle ones alternate, about 2 cm. apart on each side, 17 to 19 cm. long, 2 to 2.5 cm. broad, the apex deeply serrate; lowermost pinnæ subopposite, 4 to 6 cm. apart, 6 to 8 cm. long, 1 to 1.3 cm. broad; secondary rachises with a few linear dark-brown light-margined scales toward the base, elsewhere with dark brownish stellate light-centered scales mingled with yellowish hairs; pinnules of the middle pinnæ 40 to 45 pairs, slightly oblique, free, mostly short-stalked, the upper ones constricted above the rounded base and unequally hastulate, the lower ones fully hastulate and cut to the costa, the basal divisions rounded and free; margins subentire, only the apex of the pinnule regularly crenate-serrate; costæ elevated, bearing stellate scales and hairs like those of the secondary rachis; veins 10 to 12 pairs, once forked near the base; sori 4 or 5 pairs, close to the costa; indusia dark reddish brown, subhemispheric, open, firm, persistent, the margins entire; receptacle large, capitate.

Type in the U. S. National Herbarium, no. 523240–523242, collected from the forested slopes of the Finca Las Gracias, Yateras, province of Oriente, Cuba; altitude about 500 meters, May 5, 1907, *Maxon* 4474. Known only from the specimens of this collection, the type consisting of a single frond, with a portion of the rhizome, mounted upon three sheets.

3. **Cyathea minor** D. C. Eaton, Mem. Amer. Acad. II. **8:** 215. 1860.

TYPE LOCALITY: Monte Verde, Cuba, *Wright* 949.

DISTRIBUTION: Known only from the province of Oriente, Cuba, only the following seen, besides the type specimens: Santa Ana, about 6 miles north of Jaguey, Yateras, Oriente, altitude 600 to 625 meters, in a partially shaded ravine, April 23, 1907, *Maxon* 4134.

4. **Cyathea pubescens** Mett.; Kuhn, Linnaea **36:** 164. 1869.

TYPE LOCALITY: Jamaica.

DISTRIBUTION: Common in the Blue Mountains of Jamaica, at altitudes of from 1,500 to 2,100 meters. Also in Porto Rico, upon the summit of El Yunque. Reported from Haiti.

5. **Cyathea balanocarpa** D. C. Eaton, Mem. Amer. Acad. II. **8:** 215. 1860.

TYPE LOCALITY: Eastern Cuba, *Wright* 1063.

DISTRIBUTION: Known only from the province of Oriente, Cuba, on partially wooded mountain slopes; altitude, 1,000 to 1,200 meters.

Besides the type collection, only the following have been seen by the writer: Jiguarto Mountain, Sevilla estate, Sierra Maestra, altitude about 1,020 meters, September 18, 1906, *N. Taylor* 508; upper slopes and summit of the Gran Piedra, altitude about 1,200 meters, trunk 3 to 4.5 meters high, April 14, 1907, *Maxon* 4031.

## A REVISION OF THE WEST INDIAN SPECIES OF POLYSTICHUM.

In his description of *Polystichum triangulum*, under plate 33 in his Exotic Ferns, Hooker remarks, with respect to variation in this genus, that it would be "no enviable task" to undertake the description of the exotic species. The remark is repeated at page 14 of the fourth volume of the Species Filicum; and surely no one who has attempted to deal with them on the basis of scant herbarium material alone will be inclined to dispute its aptness. Nevertheless, upon an acquaintance with the species in the field and the collection of

sufficient material for study and comparison, the difficulties in so far as the plants are concerned largely disappear, and the range of variation, great in some cases, rather slight in others, may be made out with tolerable accuracy.

This, at least, is true of the West Indian species, as observed by the writer in Cuba and Jamaica, and as represented by a large suite of specimens in the U. S. National Herbarium and the herbarium of the New York Botanical Garden. The difficulties are mostly in the matter of applying the early names, many of which were given originally to plates rather than to plants. The historic *P. triangulum* itself offers greater difficulties than any other, and even as now dealt with is probably not closely enough delimited, further material from Santo Domingo being necessary to a clearer understanding of the species.

The characters of the genus as a whole are too well known to require elaboration here, but several secondary features not commonly regarded as diagnostic may be pointed out, as these have seemed to the writer to be quite constant. These are: (1) The presence or absence of a proliferous bud upon the rachis; and (2) the position of this, whether (*a*) terminal at the truncate or retuse apex, (*b*) borne some distance below the foliose apex, or (*c*), as is often the case, at the end of a cirrhate or flagelliform prolongation of the rachis. The extension of the rachis into a whip-like tail serves to increase the chances of successful proliferation; and in general this tendency seems to be associable with a moist shady habitat. Such plants have an arching or even a pendent habit, are less fertile than those growing in drier or more exposed situations, and obviously depend more upon vegetative reproduction and less upon the dispersal of spores.[a] Whatever may have been the cause of this correlation between habitat and form, the characters appear to be fixed and constant and the species amply distinct and recognizable. Thus no form of true *P. triangulum*, so far as the writer has observed, is proliferous, though this is a marked feature of several of its closest relatives.

The status of *P. heterolepis*, discussed below, is interesting from another point of view; that of a species apparently not re-collected in its typical form from the time of its discovery up to 1907. The *P. viviparum* of Fée is now found to be merely a young state of this strictly Cuban species and quite different from the Jamaican plant described as *viviparum* by Jenman and others. These and several others are here illustrated from photographs of the most typical

[a] In the case of *P. rhizophorum* this is manifest in a strong tendency toward dimorphism, the fertile fronds being rigidly erect and usually very much smaller than the elongate and radicant sterile ones.

specimens, with the idea of fixing more exactly than is possible by description alone the characteristic points of difference.

In conclusion, notes upon the several West Indian species to be excluded from this genus are presented.

The species as here treated may be separated by the following artificial key. The specimens listed are either in the U. S. National Herbarium or the herbarium of the New York Botanical Garden, unless otherwise stated.

KEY TO THE SPECIES.

Rhizome sarmentose; fronds uniserial (§ RUMOHRA)..... 2. *P. adiantiforme.*
Rhizome erect or ascending; fronds cespitose (§ EUPOLYSTICHUM).
Lamina subentire to deeply pinnatifid.
Lamina subentire, somewhat lobed at the base, the apex retuse..... 12. *P. plaschnickianum.*
Lamina deeply pinnatifid below, the apex long-attenuate..... 16. *P. rhizophyllum.*
Lamina once to thrice pinnate.
Normally once pinnate only.
Proliferous.
Apex foliose, retuse..... 19. *P. underwoodii.*
Apex naked, flagelliform.
Lamina linear, elongate..... 9. *P. ilicifolium.*
Lamina broader and shorter, lanceolate to linear-lanceolate.
Fronds difform, the fertile conspicuously shorter and long-stipitate..... 15. *P. rhizophorum.*
Fronds conform, of equal size.
Pinnæ straight or nearly so, deeply crenate-lobulate, nonspinulose..... 7. *P. harrisii.*
Pinnæ falcate, lightly crenate-serrate, spinulose..... 4. *P. decoratum.*
Nonproliferous.
Stipe and rachis rather dark, closely covered with persistent chaff..... 17. *P. struthionis.*
Stipe and rachis light-colored; chaff scant, mostly deciduous.
Lamina short, ovate to broadly ovate, long-stipitate..... 10. *P. longipes.*
Lamina elongate, lanceolate to linear.
Plants delicate; margins of pinnæ erose-dentate..... 6. *P. guadeloupense.*
Plants rigidly coriaceous; pinnæ variously spinescent-serrate..... 1. *P. triangulum.*
More than simply pinnate.
Nonproliferous.
Pinnæ unequally trifoliolate, the terminal division narrow..... 18. *P. tridens.*
Lamina tripinnate or quadripinnatifid..... 11. *P. muricatum.*

Proliferous.
Apex of lamina acute; bud borne upon the rachis, below the apex.
Rachis slender, straight: pinnæ lanceolate, the inferior basal pinnule greatly reduced..... 14. *P. polystichiformis.*
Rachis stout, flexuous; pinnæ elongate-triangular, the inferior basal pinnule scarcely reduced..... 13. *P. platyphyllum.*
Apex of lamina truncate; bud terminal.
Lamina ovate, tripinnatifid or tripinnate..... 3. *P. christianae.*
Lamina narrowly lanceolate, bipinnatifid to bipinnate.
Lamina chartaceo-coriaceous, bipinnate; pinnæ 35 to 40 pairs... 8. *P. heterolepis.*
Lamina extremely coriaceous, bipinnatifid, only the superior basal segment free; pinnæ 20 to 30 pairs..... 5. *P. dissimulans.*

1. **Polystichum triangulum** (L.) Fée, Gen. Fil. 279. 1850–1852.
*Polypodium triangulum* L. Sp. Pl. **2:** 1088. 1753.
*Aspidium triangulum* Sw. Schrad. Journ. Bot. **1800**[2]: 31. 1801.
*Polypodium muricatum* Sw. Prodr. 131. 1788, not L. 1753.
*Polypodium echinatum* Gmelin, Syst. Nat. **2**[2]: 1309. 1791.
*Aspidium mucronatum* Sw. Schrad. Journ. Bot. 1**8** **0**[2]: 30. 1801.
? *Aspidium trapezoides* Sw. Schrad. Journ. Bot. **1800**[2]: 31. 1801.
*Polystichum mucronatum* Presl, Tent. Pterid. 83. 1836.
? *Polystichum cyphochlamys* Fée, Gen. Fil. 279. 1850–1852; 6me Mém. 20. *pl. 3. f. 4.* 1853.
? *Polystichum falcatum* Fée, Gen. Fil. 279. 1850–1852, not Diels, 1899.
*Polystichum echinatum* C. Chr. Ind. Fil. 83. 1905; 581. 1906.

The basis of the Linnæan *Polypodium triangulum* is the "*Trichomanes folio triangulo dentato*" of Petiver, illustrated at plate 1, figure 10. This is obviously redrawn from Plumier's plate 72, which represents a plant said to have come from Santo Domingo. The further names to be considered in fixing upon the limits and synonymy of this strictly West Indian species are as follows:

1. *Polypodium muricatum* Sw., 1788. Founded upon Sloane's plate 36, figures 4 and 5, these representing Jamaican plants, probably of different species. In publishing the name *mucronatum* to replace his homonym *muricatum*, Swartz in 1801 again cites these two figures. In 1806,[a] however, he restricts his citation to figure 4 which thus may be held as typical of his species *mucronatum*. But figure 4 shows only a broad form of *P. triangulum*,[b] and *mucronatum* will thus become a synonym of *triangulum*. Figure 5 is discussed under the next name following:

2. *Polypodium echinatum* Gmelin, 1791. The original description is brief, based upon Sloane's plate 36, figures 4 and 5, which, as noted above, probably represent different species. If typified arbitrarily by figure 4, *P. echinatum* is synonymous with *A. mucronatum* Sw. and must be written as a synonym of *P. triangulum*. The spinulose character shown in figure 4 is sufficient to indicate that this rather than figure 5

[a] Fl. Ind. Occ. **3:** 1649. 1806.

[b] The strictly Jamaican species which Hooker mistakenly regarded as *mucronatum*, and which he figured under that name, is *P. struthionis;* see page 37.

furnished the basis for Gmelin's peculiarly descriptive specific name. Figure 5, indeed, shows a plant with crenate pinnæ, which can not well be an example of this species; the only material seen which approaches it is a single sheet of poor specimens from the vicinity of Troy, Jamaica, altitude 450 to 660 meters, *Underwood* 2837. These are an abnormal state apparently and can not be referred definitely to any described species; they are perhaps nearest *triangulum*, but differ not only in form but in the soft ferruginous vestiture of the rhizome. Further collections may establish their claim to rank as a distinct species; in any event Gmelin's name can not possibly apply to them. In this connection may be noted Christensen's error in applying the name *echinatum* to the plant wrongly called *mucronatum* by Hooker. See under *P. struthionis*.

3. *Aspidium trapezoides* Sw., 1801. A name given by Swartz to West Indian plants, the diagnosis being short, unsatisfactory, and without reference to any published figure. The description is repeated at page 44 of the Synopsis Filicum, and is elaborated in the larger work of the same year[a] with citation of Sloane's plate 36, figure 1. This figure represents a dwarf relatively broad-leaved Jamaican plant of a type certainly not very common in Jamaica but probably referable to *P. triangulum*. It is assuredly no form of "*P. viviparum*," as Christensen suggests with doubt; that is to say, no form of *P. heterolepis* nor of *P. dissimulans* of the present paper.

4. *Polystichum falcatum* Fée, 1850–1852. Described from Santo Domingo and best regarded as an extreme form of *P. triangulum*.

5. *Polystichum cyphochlamys* Fée, 1850–1852. Founded upon Cuban specimens collected by Linden (no. 2175), the precise locality not stated. It is presumably one of the complex of variable Cuban forms discussed below and retained for the present under *P. triangulum*.

*Polystichum triangulum*, even when restricted as in the present treatment, is an exceedingly variable species. The typical form of Plumier's plate 72 is possibly not very common in Santo Domingo, the few specimens seen from Haiti always showing broader fronds. Matching the plate best are certain Jamaican specimens (*Maxon* 1201, 1489, 1873, 1883, 1884, 1887, 2207, 2555, 2591, 2827, 2968; *Underwood* 1167, 1822, 2838). Among these some are narrower and some broader than indicated in plate 72. The narrower form is illustrated at plate 33 of Hooker's Exotic Ferns (1859), but the pinnæ are almost invariably serrate-spinescent. Between these extremes of size in Jamaica there seems to be every intergradation, and there is a similar intergradation in various other characters directly associable with habitat; hence, far apart as are the extremes, there appears to be no sufficient reason for separating any of the forms specifically. The Cuban plants average much broader than the Jamaican and show far greater variation in cutting; some few of them agree closely with Haitian specimens collected by Nash and Taylor (nos. 1341 and 1352) which probably represent the *P. falcatum* of Fée. These last may, indeed, prove to be a distinct species, yet they seem to connect with the narrow form through the following Cuban series, all from the province of Oriente: *Maxon* 4243, 4260, 4267, 4459, 4461. *P. triangulum* as thus defined is not unlikely an aggregate, requiring to be restudied later with the aid of more abundant material from Santo Domingo. To attempt at present to distinguish by name the large number of supposed or probable intermediates even varietally or subspecifically would serve no useful purpose.

Jenman's description[b] is excellent for the ordinary form, though the measurements are less than for many of the Cuban and Haitian specimens. The species, as here understood, is never proliferous.

Known from the islands of Santo Domingo, Cuba, and Jamaica. In Jamaica it is common in rocky situations at from 600 to 1,800 meters.

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[a] Fl. Ind. Occ. **3**: 1647. 1806.

[b] Bull. Bot. Dept. Jamaica II. **2**: 296. 1895.

2. **Polystichum adiantiforme** (Forst.) J. Sm. Hist. Fil. 220. 1875.
*Polypodium adiantiforme* Forst. Prodr. 82. 1786.
*Polypodium coriaceum* Sw. Prodr. 133. 1788.
*Aspidium coriaceum* Sw. Schrad. Journ. Bot. **1800**[2]: 40. 1801.
*Polystichum coriaceum* Schott, Gen. Fil. under *plate 9*. 1834.
*Aspidium capense* Willd. Sp. Pl. **5:** 267. 1810, not Sw. 1801.
*Polystichum capense* J. Sm. Bot. Mag. **72:** Comp. 35. 1846.
*Rumohra aspidioides* Raddi, Op. Sci. Bologn. **3:** 290. *pl. 12. f. 1*. 1819.
*Aspidium discolor* Langsd. & Fisch. Ic. Fil. 16. *pl. 18*. 1810.
*Polystichum discolor* Brack. U. S. Expl. Exped. **16:** 207. 1854.

The type of *Polypodium adiantiforme* was from Polynesia; that of *Polypodium coriaceum* from Jamaica; of *Aspidium capense* from the Cape of Good Hope; of *Rumohra aspidioides* from Brazil; of *Aspidium discolor* from Brazil. If it be correct to associate these names for a single species, the range of that species is a most unusual one; yet the points of difference noted in the series at hand from South Africa, Mauritius, the West Indies, Bermuda, Brazil, New Zealand, and the Seychelles are such as appear not to warrant segregation.

The following specimens have been noted from the West Indies:

JAMAICA: Near Cedarhurst, altitude 600 meters, *Underwood* 1552. Near Troy, altitude 450 to 600 meters, *Underwood* 2867. Crown lands 4 miles west of Troy, altitude 750 meters, *Maxon* 2926. Hollymount, Mount Diablo, altitude 750 meters, *Maxon* 2227, 2229. Near Cinchona, altitude 1,500 meters, *Harris* 7599. The Red Hills, *Day*. Without locality, *Jenman; Hart* 252.

CUBA: *Wright* 999.

PORTO RICO: Near Cayey, *Sintenis* 2771. Mount Mandios, near Jayuya, *E. G. Britton & Marble* 956. Maricao, *Sintenis* 434. Sierra de Luquillo, *Eggers* 1341 (small specimens).

3. **Polystichum christianae** (Jenman) Underw. & Maxon in herb. PLATE 2.
*Aspidium christianae* Jenman, Bull. Bot. Dept. Jamaica II. **2:** 285. 1895.

Confined to Jamaica, where it is said by Jenman to be "common in woods on the Manchester mountains at 2,000 ft. altitude." The specimens studied by the writer are:

Vicinity of Hollymount, Mount Diablo, altitude about 750 meters, *Maxon* 1880, 1955, 2343. Mount Diablo, altitude 600 meters, *Underwood* 1891. Without locality, *Jenman*.

Jenman's description, which on the whole is good, applies to the maximum attained by this species in both size and cutting. The general resemblance to *D. mexicana* also is not exaggerated by him, though from the wide variation in cutting the similarity is more pronounced in some fronds than in others in which the pinnules and lobes are quite acute. The caducous indusia are really orbicular and centrally peltate in attachment, except for which and for its general chaffiness the plant might pass readily enough for a Dryopteris. The large chaffy bud terminating the truncate apex is a conspicuous and nearly constant feature.

*Polypodium miser* Heward,[a] suggested by Jenman as a possible early synonym, is clearly not referable to this species but to *Dryopteris effusa* (Sw.) Urban, and the "*Polypodium effusum*" listed separately by Heward following *P. miser* was presumably a misidentification.

EXPLANATION OF PLATE 2.—Specimen from Hollymount, Jamaica, *Maxon* 1880. Scale about ⅔.

4. **Polystichum decoratum** Maxon, sp. nov. PLATE 3.

Plants laxly spreading or pendent, fronds 4 to 8, 35 to 45 cm. long, closely fasciculate, conform. Rhizome ascending, arcuate, slender, 2 to 4 cm. long, 5 to 7 mm. in diameter, with very long coarse fibrous roots, clothed at the crown with numerous

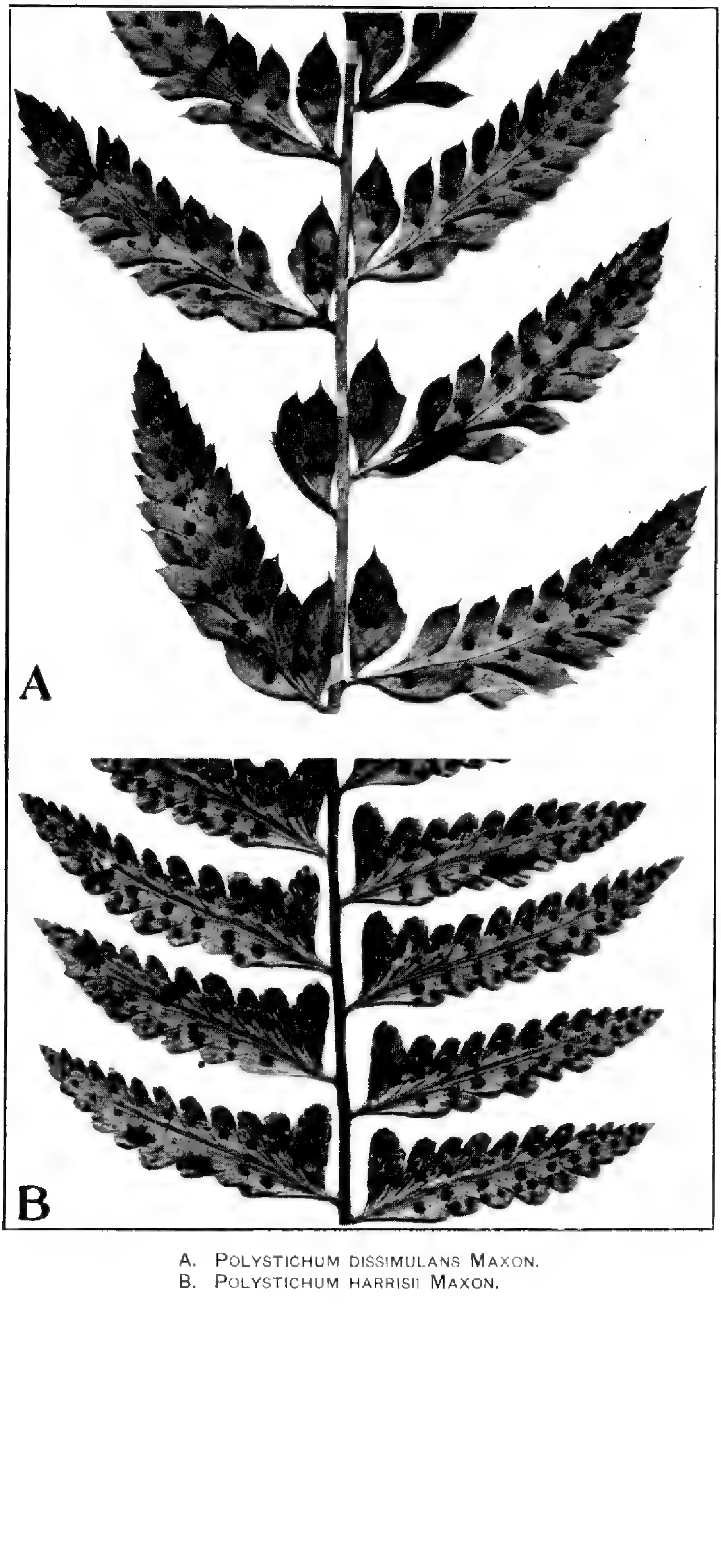
[a] Mag. Nat. Hist. II. **2:** 460. 1838. Type from Jamaica.



POLYSTICHUM CHRISTIANAE (JENMAN) UNDERW. & MAXON.



POLYSTICHUM DECORATUM MAXON.




A. POLYSTICHUM DISSIMULANS MAXON.
B. POLYSTICHUM HARRISII MAXON.

large light brown ovate scales 7 to 8 mm. long; stipe 10 to 15 cm. long, striate, light yellowish green, rather closely covered toward the base with large concolorous scales like those of the rhizome, these somewhat persistent, gradually narrower and reduced above; lamina 25 to 30 cm. long, 6 to 7 cm. broad, narrowly lanceolate, scarcely reduced below, the pinnæ subdistant or spaced about their own width, reduced gradually in the upper half to a length of about 1 cm., giving way abruptly to a stout naked flagelliform proliferous cauda 5 to 10 cm. long; characteristic middle pinnæ 3 to 4 cm. long, 7 to 8 mm. broad, falcate, at the base acutely cuneate, the lower margin widely excised, the upper sharply cuneate, auriculate, the margins otherwise rather noticeably crenate-serrate (sometimes doubly so), always most deeply in the outer half, the apex itself sharply acute; sori about 9 or 10 pairs, equidistant.

Type in the U. S. National Herbarium, no. 523612, collected on a rocky ledge in woods at the base of the Farallones of La Perla, near Monte Verde (north of Jaguey), Yateras, Oriente, Cuba, altitude about 540 meters, by William R. Maxon, no. 4408, May 2, 1907. Several sheets of this number which have been preserved show very slight variation.

*P. decoratum* is closest allied to the Jamaican *P. rhizophorum*, from which it differs mainly in its larger and conform fronds, its narrower, longer, and falcate pinnæ, and glabrous under surface. There appears to be not the slightest tendency toward the dimorphism so conspicuous in *P. rhizophorum*. The fronds are uniformly flagellate and proliferous, many bearing at the apex young plants from 2 to 3 cm. high.

Observed by the writer only at the one locality. Wright's no. 828 is, in part, the same (Y, N), this having been referred by Jenman in his description of *P. rhizophorum* as "near our plant." Eggers's no. 4919, from the vicinity of Jaguey, as represented by a specimen in the National Herbarium, is also identical.

EXPLANATION OF PLATE 3.—The type specimens. Scale about ⅓.

**5. Polystichum dissimulans** Maxon, sp. nov. PLATE 4, FIGURE A.

*Aspidium viviparum* Jenman, Bull. Bot. Dept. Jamaica II. **2:** 267. 1895, in part, not *Polystichum viviparum* Fée, 1850–52.

Rhizome stout, erect, clothed with large, blackish glistening scales without and mostly lanceolate to linear flaccid rufous scales within; stipes stout, rigid, sulcate, stramineous, 13 to 26 cm. long, clothed sparingly at the base with large rufous scales and similar linear scales; lamina narrowly lanceolate, deeply bipinnatifid, 25 to 40 cm. long, 8 or 9 cm. broad, exceedingly coriaceous, comprising about 25 to 30 pairs of rigid divergent or somewhat ascending spinescent pinnæ; lowermost 3 or 4 pairs of pinnæ distant, nearly opposite, the succeeding pairs contiguous, similar in form but slightly narrower and longer, those toward the apex simply serrate, uniformly and gradually reduced in size to a somewhat elongate foliose apex terminating abruptly in a large viviparous bud; rachis stout, clothed with reduced fibrillose tawny deciduous scales; characteristic middle pinnæ 5 or 6 cm. long, 13 to 15 mm. broad at the middle, fully pinnate at the base, the superior basal segment largest, erect, free, unequally ovate, spinescent, the inferior basal segment similar but narrower, smaller and very oblique, the pinna otherwise deeply pinnatifid with oblique spinescent segments or sometimes only deeply serrate, the serrations sharply spinescent, the apex always acute and aristate; sori numerous, commonly biserial, the rows incomplete.

Type in the U. S. National Herbarium, no. 427751, collected on a wooded bank near the Green River, on the trail from Cinchona to Blue Mountain Peak, Jamaica, by William R. Maxon, no. 1491, April 22, 1903. *Underwood* 2560, in the herbarium of the New York Botanical Garden, has identical data. The following additional specimens may be cited:

JAMAICA: Chestervale, altitude 900 meters, *Underwood* 1178. Silver Hill, altitude 1,050 meters, *Harris* 7158. Without locality, *Jenman* (2 sheets). Without locality, *ex herb. Bot. Dept. Jamaica*. Without locality, *Hart* 176.

*Polystichum dissimulans* probably embraces most of the Jamaican material included by Jenman as typical of his "*Aspidium viviparum*," excluding the several subspecies recognized by him. It is about equally related to *P. triangulum* and the endemic Cuban *P. heterolepis*, though perhaps more closely allied to the latter. From *P. heterolepis* it differs in its chaff, its lesser subdivision and in mature states, its relatively broader pinnæ and especially in its exceedingly harsh coarse texture and long-spinescent segments. From any form of *P. triangulum* it is distinguished by its viviparous apex and regularly free-auriculate pinnæ. It is the most rigid of all the middle American species of Polystichum.

EXPLANATION OF PLATE 4, FIGURE A.—Middle portion of type specimen. Natural size.

6. **Polystichum guadeloupense** Fée, 11me Mém. Foug. 74. *pl. 19. f. 2.* 1866.

This must be regarded as a very doubtful species. The type, collected by L'Herminier from rocks along the sea shore in some part of Guadeloupe, indicates, according to Fée's diagnosis and illustration, a species unique in the *triangulum* group in its sharply erose-dentate (scarcely spinulose) margins, in this character resembling young plants of *Stenochlaena kunzeana* (Presl.) Underw. A small specimen collected in Guadeloupe by Duss (no. 4343), in the herbarium of the New York Botanical Garden, is apparently the same. But this scarcely differs more from the Greater Antilles specimens of *P. triangulum* than the specimens of undoubted *triangulum* do among themselves, suggesting that it may be only a small delicate form of the well-known species. If it does attain a larger state in Guadeloupe it is strange that it should not have been collected by Duss. More complete collections in future may perhaps establish its claim to rank as a distinct species. It is so recognized by Christensen, whether or not on the basis of specimens actually examined the writer does not know.

7. **Polystichum harrisii** Maxon, nom. nov. PLATE 4, FIGURE B.

*Aspidium caudatum* Jenman, Journ. Bot. **8:** 260. 1879, not *A. caudatum* Sw. 1806, nor Sw. 1817.

*Aspidium viviparum caudatum* Jenman, Bull. Bot. Dept. Jamaica II. **2:** 268. 1895.

Jenman's original description of this species is accurate, except that the under surfaces may be said to be very sparingly and minutely scaly, glabrescent instead of glabrous. The numerous large scales of the rhizome and lower stipe are membranous and of a rich brown color, never (in the specimens examined) blackish and glossy as in the various forms of *triangulum*.

Confined to Jamaica and said by Jenman to be "frequent in the western parishes, Manchester, Clarendon, etc., above 1,500 or 2,000 feet altitude."

JAMAICA: Vicinity of Troy, altitude 600 to 660 meters, in rocky forests, sometimes in clefts of rocks, *Maxon* 2848, 2862; *Underwood* 2963. Tyre (near Troy), *Underwood* 3309, 3310. Without locality, *Jenman* (4 sheets labeled *Aspidium caudatum*).

The name is given in honor of William Harris, esq., superintendent of Hope Gardens, Jamaica, in grateful acknowledgment of courtesies extended to the writer in many ways during his field work in Jamaica in 1903 and 1904.

The type, collected in 1878, is at Kew.

EXPLANATION OF PLATE 4, FIGURE B.—Middle portion of a specimen from Troy, Jamaica, *Maxon* 2848. Natural size.

8. **Polystichum heterolepis** Fée, Gen. Fil. 279. 1850–1852. PLATE 5.

*Polystichum viviparum* Fée, Gen. Fil. 280. 1850–1852.

*Aspidium viviparum* Mett. Abhand. Senck. Nat. Gesell. **2:** 328. 1858.

Fronds several, chartaceo-coriaceous, elongate (75 cm. long, maximum), long-stipitate, conform. Rhizome stout, woody, ascending, thickly covered with chaff of two kinds, the one linear, flaccid, fulvous, the other ovate, rigid, carinate, dark, lustrous, with fulvous borders; stipe 20 to 30 cm. long, light greenish brown, deeply canaliculate, rather closely covered with slender spreading fulvous scales (appressed



POLYSTICHUM HETEROLEPIS FÉE.

with age) and a few larger lanceolate scales, these concolorous or often dark-centered, usually divergent; lamina glabrous above, below laxly paleaceous-pilose, bipinnate, 35 to 45 cm. long, very narrowly lanceolate, 10 to 13.5 cm. (maximum) broad at the middle, somewhat reduced below, the apical portion foliose throughout, narrow and long-attenuate, terminating in a large chaffy proliferous bud; pinnæ about 35 to 40 pairs, the lower ones subdistant, the others contiguous, all short-petiolate and divergent from the stout rachis, this very thickly beset with chaff like that of the upper stipe; characteristic large pinnæ 6.5 to 7 cm. long, narrowly lanceolate except for the greatly enlarged erect deeply auriculate superior basal pinnule, this 1.5 to 2 cm. long; pinnules about 9 or 10 pairs, rigidly aristate, all but the upper basal one unequally lanceolate-ovate or trapeziform-ovate, simple, oblique, cuneate, mostly petiolate, adnate and confluent only toward the serrate-spinescent apex of the pinna; nervation manifest above, nearly concealed below; sori large, numerous, about 10 upon the superior basal pinnule, the other pinnules bearing 4 to 6 each; indusia large, delicate, glabrous, deciduous.

CUBA: Near the summit of the Gran Piedra, Oriente, altitude about 1,100 meters, in partial shade, *Maxon* 4047, 4068.

The types of both *P. heterolepis* and *P. viviparum* were contained in Linden's no. 1742, from the present province of Oriente, Cuba. The original descriptions bring out different characters; but these are found to be common to the specimens of a large series collected by the writer (as cited above) which undoubtedly represent only a single species. Fée's separation into two "species" of the specimens collected by Linden under no. 1742 thus seems quite unwarranted, as the following data will show:

*Polystichum heterolepis* was described as having two kinds of scales upon the stipe and rachis, a character which, though true, is not obvious, owing to the usual abrasion of the larger dark scales; the slender concolorous fulvous scales commonly predominate. Further, no mention was made of the proliferous apex; but this was almost certainly due to imperfect material, for the fronds of the entire series of 4047 and 4068 are nearly without exception proliferous. The larger examples show well the special character mentioned by Fée: "inferiore [frondula] multo majore auriculata, rachim tectante;" by which is meant the superior *basal* pinnule which is greatly enlarged and lies along the rachis. The larger and mature specimens of the series are, as described above, bipinnate. Immature and smaller specimens quite accord with Fée's description and illustration of *P. viviparum*. Mettenius's description is excellent, but hardly applies to the most luxuriant development of the species as shown in plate 5, representing a section through the broader middle part of a large frond. The sori are readily abraded, leaving a slight depression in the frond.

*Aspidium caudatum* Jenman, referred by Christensen[a] to the all-inclusive *P. viviparum* (in accordance with Jenman's treatment of the group), is not closely allied. It is the form here called *P. harrisii*.

EXPLANATION OF PLATE 5.—Middle portion of a specimen from the Gran Piedra, Cuba, *Maxon* 4047. Natural size.

9. **Polystichum ilicifolium** Fée, Gen. Fil. 279. 1850–1852; 6me Mém. 21. *pl. 6. f. 4.* 1853, not *Aspidium ilicifolium* Don, 1825, which is *Polystichum ilicifolium* Moore, 1858.

*Polystichum aquifolium* Underw. & Maxon, Bull. Torr. Club **29**: 584. 1902.

The type of *Polystichum ilicifolium* Fée was from the province of Oriente (Santiago), Cuba (*Linden* 2193). Agreeing closely with this, as subsequently figured, are the following specimens, all from the same region:

CUBA: Vicinity of El Cobre, Oriente, *Pollard & Palmer* 420. Mountains, Upper Guama River, south slope of the Sierra Maestra, altitude 540 meters, *N. Taylor* 226. Valley of the Rio Bayamita, south slope of the Sierra Maestra, altitude 900 to 1,050 meters, *Maxon* 3921. Without locality, *Wright* 829.

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[a] Ind. Fil. 68. 1905.

The narrow and very long fronds (maximum 60 cm.) and subquadrangular long-aristate pinnæ are very characteristic of this species which is known only from Cuba. The fronds of mature plants almost invariably bear young plants at the flagelliform apex.

10. **Polystichum longipes** Maxon, sp. nov. PLATE 6.

Fronds 45 to 52 cm. long, nonproliferous, long-stipitate, stiff, coriaceous, probably suberect in habit. Rhizome ascending, woody, stout, about 1 cm. or less in diameter, the crown and stipe bases clothed with flaccid reddish brown scales, these lanceolate to ovate, with tortuose linear fibrillose scales intermixed; stipes 20 to 30 cm. long, stout, 1.5 to 2 mm. in diameter, light brown, very firm, terete, with a furrow along the anterior face, sparingly fibrillose, glabrate with age; lamina relatively short and broad, 15 to 22.5 cm. long, 8 to 12 cm. broad, ovate to very broadly ovate, acuminate, the rachis and lower surface of the pinnæ sparsely fibrillose, glabrate with age; pinnæ 7 to 10 pairs, spreading, very coriaceous, hastate, subhastate, or even auriculate, unequally cuneate or the upper base subtruncate, broadest near the base, otherwise lanceolate, the margins undulate or lightly sinuose-crenate, the apices acute or somewhat attenuate; lowermost pinnæ 5 to 7 cm. long, 1.5 to 2 cm. broad near the base, petiolate, alternate or scarcely subopposite; pinnæ immediately succeeding nearly of the same size, alternate, distant; upper pinnæ gradually smaller and closer, sessile, in the sterile fronds reduced abruptly at the subcaudate acuminate apex, in the fertile fronds decreasing more gradually, adnate; veins mostly 3 or 4 times branched, close, evident as striations on the lower surface; sori in a single row upon each side of the midvein, much nearer the margin than the midvein and extending nearly to the petiole.

Type in the U. S. National Herbarium, no. 50221, collected in Cuba, without definite locality, by Charles Wright, no. 3924. Specimens of the same number are in the Gray Herbarium, the D. C. Eaton Herbarium, the Sauvalle Herbarium, and the herbarium of the New York Botanical Garden.

The species is without any very close allies, standing rather apart from the other members of the *triangulum* group. It was indicated by Eaton as doubtfully new.

EXPLANATION OF PLATE 6.—The type specimens. Scale about ⅓.

11. **Polystichum muricatum** (L.) Fée, Gen. Fil. 278. 1850–1852.

*Polypodium muricatum* L. Sp. Pl. **2:** 1093. 1753, not Sw. 1788.

*Aspidium muricatum* Willd. Sp. Pl. **5:** 264. 1810.

The oldest binary name applied to any tropical American member of the *aculeatum* alliance is that of the *Polypodium muricatum* of Linnæus, a species established upon Petiver's plate 1, figure 6, this in turn a small copy of Plumier's plate 39, representing a plant from Santo Domingo. This or very closely allied forms from the North and South American tropics have since received many names, and the later synonymy is very involved. For the purposes of the present paper it is sufficient to point out the availability of the name *muricatum* for the plant of the West Indies, which is abundantly distinct from *P. aculeatum*. Kuhn,[a] in taking up the Linnæan name for specimens from Santo Domingo, Cuba, Mexico, Costa Rica, and several South American countries, adduces many supposed synonyms and discusses the group critically at some length. Much of this material probably belongs to other species.

*Polystichum muricatum* is described briefly by Jenman,[b] who states that it is common in Jamaica "on the banks of streams in forests at 4,000 to 6,000 feet altitude." Plumier's figure, though exaggerated as to spinescent pinnules, is excellent as to size, proportions, and general appearance.

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[a] Abhand. Nat. Gesell. Halle **11:** 33 et seq. 1869.

[b] Bull. Bot. Dept. Jamaica II. **2:** 270. 1895, as *A. aculeatum moritzianum* (Klotzsch).



POLYSTICHUM LONGIPES MAXON.

JAMAICA: Clyde River valley, altitude about 1,200 meters, *Underwood* 422, 2654, 2654b; *Maxon* 1604, 1604a. Without locality, *Gilbert* 30: *Hart* 30, 31, 32.
HAITI: Without locality, *Picarda* 658 (det. Kuhn).

12. **Polystichum plaschnickianum** (Kunze) Moore, Ind. Fil. 100. 1858.
*Aspidium plaschnickianum* Kunze, Linnæa **23**: 239, 302. 1850.

The "most simple-fronded of all the Polystichum group," as Hooker remarked. It was described originally from cultivated specimens of uncertain origin, and is known at present only from Jamaica, where, according to Jenman, it is "common in forests and on shady wayside banks and rocks above 4,500 feet." Hooker's figure of it is creditable, but Jenman's description will be found rather more complete.[a]

JAMAICA: Blue Mountain Peak, altitude 1,950 to 2,225 meters, *Underwood* 1448. Highest slopes of John Crow Peak, altitude 1,650 to 1,800 meters, *Underwood* 707, 2443; *Maxon* 1320. Trail between Morces Gap (1,500 meters) and Vinegar Hill (1,185 meters), *Maxon* 1516; *Underwood* 1372, 2593; *Harris* 7343. Vicinity of Morces Gap, altitude 1,500 meters, *Maxon* 2768; *Underwood* 3136a; *Clute* 61. Near Cinchona, altitude 1,500 meters, *Harris* 7588. Without locality, *Hart* 12.

13. **Polystichum platyphyllum** (Willd.) Presl, Tent. Pterid. 84. 1836.
*Aspidium platyphyllum* Willd. Sp. Pl. **5:** 255. 1810.

The type of this species was from Caracas, Venezuela, collected by Bredemeyer, and the species itself is not well represented in American herbaria. A single Jamaican specimen of Jenman's collecting (definite locality not given) in the herbarium of the New York Botanical Garden agrees essentially with South American material available for comparison and differs from any other West Indian specimen seen. The nearest ally is *P. polystichiformis*. *P. platyphyllum* is a coarser, stouter plant than this, with heavier stipe and flexuose rachis. The pinnæ are elongate-triangular, broadest at the base, the inferior basal pinnule being scarcely at all reduced in comparison with the dwarfed long-cuneate lower basal pinnule of *P. polystichiformis*.

Known, in the West Indies, only from Jamaica.

14. **Polystichum polystichiformis** (Fée) Maxon.
*Phegopteris polystichiformis* Fée, Gen. Fil. 243. 1850–1852.
*Polystichum tenue* Gilbert, Fern Bull. **8:** 63. 1900.

The *Phegopteris polystichiformis* of Fée was founded upon a plant collected by Linden (no. 1874) in the vicinity of Monte Libano, in the present province of Oriente, Cuba. The description, though not complete, indicates with reasonable certainty that Wright's no. 832, collected a few miles to the eastward at Monte Verde, is the same. This was listed by Sauvalle[b] as *Polypodium polystichiforme* and by Eaton[c] as *Phegopteris platyphylla* Mett. So far as the writer knows, the species has not been collected since in Cuba.

In 1900 Gilbert described a new species, *Polystichum tenue*, from Jamaica, as a segregate from the Jamaica forms included by Jenman under the name *Aspidium aculeatum*. This, as shown by a large series of specimens collected by Professor Underwood and the writer, agrees well with Wright's Cuban plant. The species has, apparently, a restricted range in Jamaica, all the specimens seen being from a single locality in the Blue Mountains.

In its lesser dimensions, smaller parts, and very delicate texture *P. polystichiformis* differs widely from *P. platyphyllum*, as Gilbert pointed out in the case of the Jamaican material. It is, apparently, confined to Cuba and Jamaica.

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[a] Bull. Bot. Dept. Jamaica II. **2:** 197. 1895.
[b] Sauvalle, Flora Cubana 214. 1868.
[c] Mem. Am. Acad. II. **8**: 207. 1863.

CUBA: Monte Verde, Oriente, *Wright* 832.

JAMAICA: Clyde River Valley (below Cinchona), altitude 900 to 1,200 meters, *Underwood* 428, 429, 430, 442, 2644, 2645, 2648, 2649; *Maxon* 1595, 1599; *Harris* 7161. Without exact locality, *Hart* 29, 32a.

15. **Polystichum rhizophorum** (Jenman) Maxon. PLATE 7.

*Aspidium viviparum rhizophorum* Jenman, Bull. Bot. Dept. Jamaica II. **2:** 268. 1895.

Plants of relatively small stature, fronds 20 to 35 cm. long, closely fasciculate, subdimorphous, the fertile ones usually erect and noncaudate, the sterile ones flagellate-radicant and mostly horizontally arching. Rhizome slight, usually 5 to 7 mm. in diameter, 2 to 2.5 cm. long, erect or ascending, clothed sparingly with dull light brownish ovate scales; stipe slight, sulcate or somewhat compressed, greenish, with noticeable scales at the base like those of the rhizome, otherwise glabrescent, in the sterile fronds measuring 1.5 to 11 cm. long (average about 4 cm.), in the fertile frond 7 to 12 cm. long (average 10 cm. or more); rachis compressed and very narrowly alate; lamina of the sterile frond 30 to 45 cm. long, 3.5 to 5.5 cm. broad, simply pinnate or rarely again deeply pinnatifid, narrowly lanceolate, subarcuate in drying, the pinnæ approximate or somewhat spaced, the upper ones reduced and giving way (sometimes abruptly) to a slender pliant radicant cauda 8 to 18 cm. long; lamina of the fertile frond linear-lanceolate, 15 to 25 cm. long (average near the minimum), about 2.5 cm. broad, usually erect and noncaudate, the pinnæ distant; pinnæ of both sterile and fertile fronds slightly scurfy below, subtriangular-trapeziform, auriculate at the upper base, the auricle subspinescent, the margins otherwise usually not spinescent but ranging from subentire to obliquely biserrate, the inferior margin widely excised at the base; sori 5 to 7 pairs to the pinna, rather nearer the midvein than the margin.

JAMAICA: Vicinity of Hollymount, Mount Diabolo, altitude about 750 meters, *Maxon* 1912, 1932, 2277, 2356; *Underwood* 3442. Without locality, *Jenman* (two sheets).

The present species, which seems to be confined to Jamaica, was described briefly by Jenman as a subspecies of the Jamaican "*viviparum*" (*P. dissimulans* sp. nov. of the present paper), to which species it appears to have no very near relationship. It has, according to Jenman, rather a wide distribution in Jamaica; but the writer has collected it at only one station (there, however, in quantity), where it shows unmistakably the characteristic form described by Jenman. It grows, at Hollymount, in firm rocky ground or in crevices of rocks, always in the humid forest. It was never observed to occupy the more open situations favorable to *P. triangulum*, which grew in the same general locality.

Jenman's comment on this form is in part as follows: "This resembles *Polypodium reptans* Sw. in habit, the fertile fronds being erect, devoid of a tail, as a rule, and with the petioles twice as long as those of the barren ones. In the latter the upper pinnæ become gradually more distant to the uppermost of all, terminating abruptly." The writer has seen only a slight approach toward the bipinnate form mentioned by Jenman.

The closest relationship of *P. rhizophorum* is with the Cuban form herein described as *P. decoratum* and is discussed under that species.

EXPLANATION OF PLATE 7.—Specimen from Hollymount, Jamaica, *Maxon* 1912. Scale about ⅔.

16. **Polystichum rhizophyllum** (Sw.) Presl, Tent. Pterid. 82. 1836.

*Polypodium rhizophyllum* Sw. Prodr. 132. 1788.

*Aspidium rhizophyllum* Sw. Schrad. Journ. Bot. **1800**[2]**:** 31. 1801.

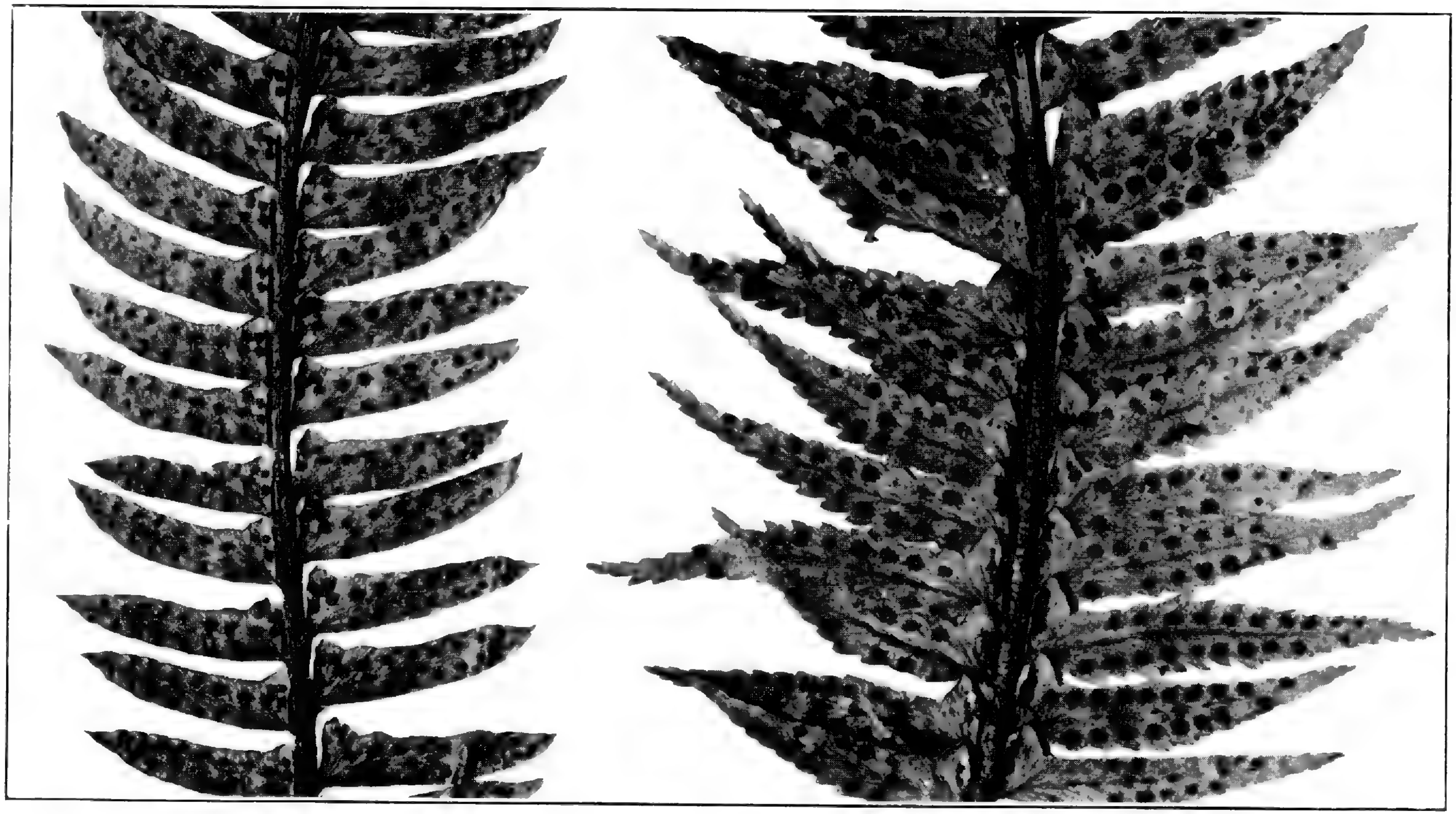
*Polystichum krugii* Maxon, Proc. Biol. Soc. Washington **18:** 215. 1905.

The present species was described originally from Jamaica and was figured later upon Jamaican specimens by Hooker and Greville.[a] It has been attributed also to

[a] Hook. & Grev. Ic. Fil. **1:** *pl. 59*. 1829.



POLYSTICHUM RHIZOPHORUM (JENMAN) MAXON.



A B

POLYSTICHUM STRUTHIONIS MAXON.

Cuba, Porto Rico, and Guadeloupe.[a] The Porto Rican material, indicated by Kuhn as a distinct species under the manuscript name *Aspidium krugii*, has since been described by the writer as *Polystichum krugii;* and with this has been associated the Wright Cuban specimen. A reexamination of the whole series, however, fails to discover any stable characters by which the extremes of this variable species may be separated. The most conspicuous character of the Porto Rican plant lies in the greatly elongate linear caudate apex, as opposed to the broader and shorter apex of the Jamaican plant; but specimens intermediate in this and other characters occur, and it is evident that situation and exposure must play an important part in determining dimensions, form, and texture of individual plants. In Jamaica, according to Jenman, the species occurs "in well-drained stony woods, on rocks and bowlders up to 1,000 feet or more." It was not observed by the writer.

JAMAICA: "Near Kingston," *Safford* 9. Without locality, *ex herb. Bot. Dept. Jamaica.* Without locality, *Purdie* (E); *Hart* 181.

PORTO RICO: Near Cayey, *Sintenis* 2240, 2240c. On the Adjuntas road, 7 miles from Ponce, *Heller* 6095. Between Aibonito and Cayey, *Mr. & Mrs. A. A. Heller* 536. Near Utuado, *Sintenis* 6274b. Bairoa (Caguas), *Goll* 342.

CUBA: Ingenio Soledad, near Cienfuegos, Santa Clara, *Pringle* 106. In crevices of rocks, Los Portales de Guame, December 31, 1864, *Wright*, no. "F" (E).

17. **Polystichum struthionis** Maxon, nom. nov. PLATE 8.

*Aspidium mucronatum* Hook. Sp. Fil. **4:** 9. *pl. 216.* 1862, not Sw. 1801.

*Polystichum echinatum* C. Chr. Ind. Fil. 83. 1905, not *Polypodium echinatum* Gmelin. 1791.

The present species is described fully by Hooker and by Jenman and is well figured by Hooker, on the basis of specimens from Jamaica, under the name *Aspidium mucronatum*. The true *mucronatum* of Swartz, however, is a form of *triangulum*, as stated on page 28, and *echinatum* is its equivalent. Schkuhr appears to have first misapplied the Swartzian name, figuring at the right of plate 29 C of his Kryptogamische Gewächse the species taken up later by Hooker under this name. Hooker's figure is much better than Schkuhr's, and neither shows any especial resemblance to Sloane's plate 36, figure 4, the prototype of *mucronatum* and *echinatum*. With a series of Jamaican plants at hand the misidentification is most obvious.

The species is, so far as definitely known, confined to Jamaica; the additional accredited range of Guadeloupe and Santo Domingo must be regarded as very doubtful, in view of the invariable misapplication of the name *mucronatum*. Dependence may be placed on Jenman's very full and accurate description, and Hooker's figure is unmistakable. The species shows no approach to any other. The deeply serrate form, mentioned by Jenman as bipinnatifid, was collected in Jamaica by the writer only once (no. 1614); it appeared to have been induced directly by the unusually open dry habitat.

JAMAICA: Highest slopes of John Crow Peak, altitude 1,650 to 1,800 meters, *Underwood* 2442; *Maxon* 1316. Vicinity of New Haven Gap, altitude about 1,650 meters, *Maxon* 2660. Near Whitfield Hall, *Maxon* 1470. Clyde River Valley, altitude 900 to 1,200 meters, *Underwood* 458, 2659; *Maxon* 1610, 1614. Near Mabess River, altitude about 1,200 meters, *Harris* 7596. Trail from Cinchona to Morces Gap, altitude 1,500 meters, *Underwood* 322, 1207. Quashi Hill, altitude 1,500 meters, *Eggers* 3763. Without locality, *N. Wilson; Gilbert; Jenman; Hart* 209.

EXPLANATION OF PLATE 8.—Fig. A, middle portion of an ordinary frond, Clyde River Valley, Jamaica, *Underwood* 458; B, middle portion of a large incised frond, same locality, *Maxon* 1614. Figures A, B, natural size.

18. **Polystichum tridens** (Moore) Fée, 11me Mém. 74. 1866.

*Aspidium tridens* Moore; Hook., Sp. Fil. **4:** 15. *pl. 215.* 1862.

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[a] Engler's Bot. Jahrb. **24:** 112. 1897. Guadeloupe specimen not seen by the writer.

Hooker's plate and description indicate well the excellent characters of the present species, which is confined to Jamaica. Only the following specimens have been studied, these showing the relatively slight variation mentioned by Hooker:

JAMAICA: Arntully, *Harris* 5952. Without locality, *Gilbert* 38; *Jenman; Purdie; N. Wilson; Hart* 28.

19. **Polystichum underwoodii** Maxon, sp. nov. PLATE 9.

?*Aspidium triangulum latipinnum* Jenman, Journ. Bot. **17**: 260. 1879; ?Bull. Bot. Dept. Jamaica II. **2**: 269. 1895; not *Aspidium latipinna* Hance, 1873.

Fronds 40 to 50 cm. long, fasciculate, suberect or spreading, long-stipitate, tolerably stout, simply pinnate, proliferous. Rhizome stout, 1.5 to 2.5 cm. in diameter, suberect or decumbent, thickly clothed with imbricate lanceolate to narrowly ovate scales, some of these fulvous but most dark brown or blackish and shining; stipe 15 to 27 cm. long, canaliculate, stramineous, covered at the base with large scales similar to those of the rhizome, otherwise rather densely clothed with deciduous linear-lanceolate attenuate reddish brown scales; lamina very narrowly deltoid, 20 to 25 cm. long, 5 to 7 cm. broad, at the base, once pinnate, tapering very gradually to the pinnatifid or subentire elongate deeply retuse proliferous apex; pinnæ 15 to 20 pairs, glabrous and dark green above, below lighter colored and minutely paleaceous-pilose, divergent, the lower ones their own width apart, subpetiolate, those above somewhat less spaced, sessile, the upper ones greatly reduced, adnate and joined by a narrow wing; lowermost pinnæ 2.5 to 3.5 cm. long, 13 to 15 mm. broad, rhombic-ovate, the apex mucronate, the base unequally and rather obtusely cuneate; margins subentire or, less often, coarsely crenate, the crenations not spinescent; sori nearly medial, borne in two rows of about 8 each and an incomplete row at the superior base; indusia large, brownish, subpersistent.

Type in the U. S. National Herbarium, no. 521270, collected near the summit of Blue Mountain Peak, Jamaica, altitude 2,100 to 2,225 meters, by Lucien M. Underwood, no. 1441, February, 1905. Specimens collected by the writer at the same locality under no. 1428 represent the crenate form included in the description. These last are, in part, subauriculate, the basal crenation in a few cases extending nearly half way to the midvein of the pinna. *Harris* 7516, from Mount Hybla, altitude 1,200 meters, represents a smaller and less complete development of the species.

For his variety *latipinnum* Jenman cites only specimens from Arntully Gap, altitude 600 meters. His incomplete description accords well with the present diagnosis, but relatively few Jamaican ferns show so great an altitudinal range. Jenman's specimen of his variety *latipinnum* at the New York Botanical Garden is without definite locality data; it differs somewhat in its more regular and very broad pinnæ and is not truly typical of the species as here defined on the basis of the Blue Mountain Peak plants.

*Polystichum underwoodii* is distinguished readily from all the other pinnate viviparous species by its nonflagelliform and deeply retuse apex.

EXPLANATION OF PLATE 9.—The type specimens. Scale about ⅓.

## SPECIES EXCLUDENDAE.

ASPIDIUM CUBENSE Kuhn, Linnaea **36**: 108. 1869.

Founded upon *Wright* 1099 from Cuba; transferred to Nephrodium by Baker (1874) and to Dryopteris by Kuntze (1891). From its indusia it is properly a Dryopteris, and is related to *D. denticulata*, which Diels follows John Smith in considering a Polystichum.

*Aspidium jucundum* Fée, as noted at page 18 of this paper, is probably an earlier name for *D. cubensis*.



POLYSTICHUM UNDERWOODII MAXON.

ASPIDIUM MELANOCHLAMYS Fée, Gen. Fil. 294. 1850–1852.

A Cuban species, founded upon *Linden* 1865, from Monte Libano, province of Santiago (Oriente); placed under Polystichum by Diels (1899), the synonymy indicated by Christensen. Known to the writer from the following specimens:

CUBA: Josephina, north of Jaguey, Yateras, province of Oriente, altitude about 575 meters, *Maxon* 4109; caverns of Thermopylæ and vicinity, Monte Libano, Oriente, altitude about 600 meters (the type locality), *Maxon* 4251.

A very peculiar species, allied to the Mexican *Dryopteris melanosticton*, and properly referred to Dryopteris by Kuntze (1891). Immature fronds show the indusia to be markedly bicolorous, orbicular, and uniformly with a very narrow sinus; the center is dark purplish brown, the margins abruptly paler.

ASPIDIUM VISCIDULUM Mett. Abhand. Senck. Nat. Gesell. **2**: 322. 1858.

The synonymy of this species, the type of Adenoderris, is correctly given by Christensen, in accordance with a paper published by the writer several years ago.[a] The relationship with Polystichum is not a very close one.

POLYPODIUM DENTICULATUM Sw. Prodr. 134. 1788.

Described originally from Jamaican specimens, the continental forms smaller and apparently constituting several poorly defined species. Like *D. cubensis*, it is in technical character of indusium a Dryopteris, as shown by an ample suite of Jamaican specimens. The synonymy is indicated by Christensen.

DICKSONIA APIIFOLIA Sw. Schrad. Journ. Bot. **1800**[2]: 91. 1801, not of later authors.

Christensen in his Index has recently pointed out that this is the earliest name for the plant usually known as *Aspidium ascendens* Heward (1838), both names having been applied originally to Jamaican plants. The species has been well characterized by Jenman and various other authors and has received at least one other specific name, having been described and illustrated upon Guatemalan specimens by Captain Smith in 1890 as *Nephrodium duale* Donn. Sm. It occurs also in Cuba. Moore (1858) regarded it as a Polystichum, in which he has been followed by Diels (1899); but however much it may resemble in habit certain species of Polystichum, notably *P. adiantiforme*, in the character of its indusium, it is technically a Dryopteris. In its habit and strongly dimorphous fronds it bears the closest resemblance to various Polybotrya species, the fertile fronds being mere skeletons in comparison with the sterile (foliar) ones. To avoid an excessive multiplication of generic names it may perhaps preferably remain under Dryopteris, but it ought at least to rank as a subgenus, for which the name **Peismapodium** is here proposed. The synonymy of *Dryopteris* (Peismapodium) *apiifolia* (Sw.) Kuntze is given in full by Christensen.

## DESCRIPTIONS OF NEW SPECIES.

**Asplenium palmeri** Maxon, sp. nov.

Rhizome slight, 4 or 5 mm. in diameter, ascending, bearing a few thickened linear-lanceolate blackish scales (1.5 to 2 mm. long) with lighter margins; fronds 4 to 8 in number, cespitose, 8 to 20 cm. long (averaging about 12 cm.), spreading, commonly arcuate throughout, particularly in the apical portion; stipes 1 to 2.5 cm. long, slender, dull purplish black; lamina 7 to 17.5 cm. long, 9 to 18 mm. broad (averaging about 12 mm.), linear, 25 to 34-jugate, reduced gradually in both directions, the apex commonly naked, flagelliform (1.5 to 2.5 cm.) and radicant, giving rise to a new plant by means of a terminal proliferous bud; characteristic middle pinnæ horizontal, 6 to 9 mm. long, 3 to 4 mm. broad, oblong, subauriculate or even subhastate, broadly and subequally cuneate, the margins regularly and conspicuously serrate; lower pinnæ shorter, hastate, very broadly cuneate, horizontal, the margins deeply and somewhat irregularly crenate-serrate, the lowermost pinnæ distant and frequently minute; sori medial, about 4 or 5 pairs to the pinna, confluent with age; indusia elliptical, firm, glabrous, the margin subentire.

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[a] Adenoderris, a valid genus of ferns. Bot. Gaz. **39**: 366–369. 1905.

Type in the U. S. National Herbarium, no. 451192; collected on a shaded mountain side near Etzatlan, State of Jalisco, Mexico, October 2, 1903, by J. N. Rose and Joseph H. Painter (no. 7582). Other specimens examined are as follows:

MEXICO: Exact locality wanting, States of Coahuila and Nuevo Leon, February to October, 1880, *Edw. Palmer* 1435 (N).[a] Southwestern Chihuahua, August to November, 1885, *Edw. Palmer* 117 (N, G). Baranca near Guadalajara, State of Jalisco, June, 1886, *Edw. Palmer* 79 (N, Y, M, E, G); *Rose & Painter* 7501 (N). Durango and vicinity, April to November, 1896, *Edw. Palmer* 555 (N, Y, M, G). Wet shady banks near Guadalajara, State of Jalisco, December 1, 1888, *Pringle* 1838 (N, M, E, P). Wet ledges, rocky hills near Chihuahua, State of Chihuahua, October, 1885, *Pringle* 444 (N, Y, M, E, G, P). Damp cool shade, Huchuerachi, State of Sonora, *C. E. Lloyd* 491 (N, G); altitude 1,200 meters, *Hartman* 319 (N, Y, G). Nacori, State of Sonora, altitude 1,725 meters, *Hartman* 293 (G). El Fortin, State of Oaxaca, altitude 1,600 meters, *Conzatti* 701 (G). Mountains near San Miguelito, San Luis Potosi, *Schaffner* 917 (E). Near Ixmiquilpan, State of Hidalgo, *Rose, Painter & Rose* 8931, 9051.

GUATEMALA: Coban, Department of Alta Verapaz, altitude 1,260 meters, September, 1885, *von Türckheim* 714 (Y). Department of Peten, *R. Walker* (J. D. S. 1154) (N).

The present species was first collected apparently by Dr. Edward Palmer, for whom the writer has had pleasure in naming it. Specimens collected subsequently by Dr. C. G. Pringle were listed by Mr. Davenport as *Asplenium trichomanes* var. *repens* Davenp., a new form[b] which Mr. Davenport thought possibly the same as the Cuban *A. heterochroum*, which had been reduced by Hooker and subsequent writers. From this, which in the light of recent collections must be regarded as a valid species, *A. palmeri* may be distinguished at once (as from all the species of this group) by its prolonged naked apex, which bears a proliferous bud at the apex, producing occasionally young plants up to 2.5 cm. in height. Nearly all the fronds are fertile; the pinnæ are somewhat coriaceous with the margins more or less inflexed, the marginal serrations sharply acute and distinct.

**Cyathea crassa** Maxon, sp. nov.

Caudex erect, 3 to 8 meters high, spiny; stipe undescribed; rachis (at least in the upper part) castaneous, polished, glabrous; pinnæ dark green above, paler below, coriaceous, oblong to deltoid-lanceolate, 40 to 60 cm. long, 15 to 22 cm. broad, sessile, with about 16 to 20 pairs of pinnules below the abruptly acuminate apex, the secondary rachis brownish castaneous, glabrous and shining on the under surface, above deeply sulcate, minutely dark pilose, and with a few scattering minute castaneous stellate scales; pinnules contiguous or slightly apart, oblong to deltoid-oblong, 8 to 11.5 cm. long, 2 to 4 cm. broad at the base, sessile or essentially so, cut nearly or quite to the costa, the apex long-acuminate, serrate-crenate; segments 13 to 17 pairs, approximate or slightly apart, oblong, subfalcate, slightly oblique, obtuse, mostly adnate, the middle and lower ones decurrent, only the basal ones sessile, these the largest (up to 2 cm. long and 8 mm. broad), deeply inciso-pinnatifid (the lobes pinnately veined, sometimes with 2 basal sori), those above deeply inciso-crenate, the uppermost dentate-serrate; costæ, costulæ, veins and surfaces glabrous below; veins (excepting those of the basal segments) 1 to 3-forked, 6 to 8 pairs, mostly fertile; sori near the costule, large, distant; indusium castaneous, deeply hemispherical, rigidly coriaceous, per-

[a] As in previous papers, E refers to the D. C. Eaton Herbarium, G to the Gray Herbarium, N to the U. S. National Herbarium, M to the Missouri Botanical Garden Herbarium, P to the C. G. Pringle Herbarium, and Y to the herbarium of the New York Botanical Garden (Underwood Herbarium).

[b] Bull. Torr. Club **13:** 130. 1888.

sistent, the margins even; receptacle capitate, somewhat hirsute, glabrescent, slightly included.

Type in the U. S. National Herbarium, no. 523876, collected in the forest upon Mount Izabel de la Torre, Santo Domingo, altitude 550 meters, *Eggers* 2735c.

The species is known to the writer only from this locality, a second number being *Eggers* 2735. It is not very closely related to any of the North American species with cup-shaped indusia and is well marked by its very broad, deeply and irregularly incised segments, and by its relatively few veins and large distant sori. The deltoid form of the pinnules is also characteristic and very unusual in species of this group. The data as to the caudex are taken from the label.

**Lycopodium underwoodianum** Maxon, sp. nov.

A very delicate, slender, freely branched pendent epiphyte, attaining a length of more than 60 cm., the apical portion to a distance of 10 cm. or more sporangiate with little or no interruption, the sporophylls not reduced; stem very slender, 0.5 mm. in diameter, many times dichotomous, flexuose, sulcate, light or yellowish green except toward the base, here more or less reddish; leaves light green, adnate, obscurely 5-ranked, divergent, all nearly equal in size, linear, strongly falciform, 9 to 12 mm. long, 0.4 to 0.6 mm. broad, about 1 to 2.5 mm. apart, twisted at the base, the midvein medial, inconspicuous but visible on one surface nearly throughout, the margins perfectly entire; sporophylls exactly like the leaves; sporangia conspicuous, orbicular-reniform, about 1 mm. broad and long, greatly exceeding the linear sporophylls and equally slender stem.

Type in the U. S. National Herbarium, no. 575691, collected from a liane in the humid forest at the finca Coliblanco, at an estimated elevation of 1,950 meters, on the lower slopes of the volcano Turrialba, Costa Rica, by William R. Maxon (no. 213), April 30, 1906. Specimens of the same number are also in the herbarium of the New York Botanical Garden, in whose interest the collecting trip to Costa Rica was undertaken.

*L. underwoodianum*, though somewhat allied to *L. linifolium* and *L. jenmani*, is one of the most distinct and strikingly peculiar species of the genus thus far discovered in the American tropics. With *L. linifolium* it needs no comparison. From *L. jenmani*[a] it differs wholly in its very slender stems, equal and subfiliform leaves, these with an inconspicuous median midvein, and in its loose diffuse habit. It is unusual for the extreme delicacy of all its parts. The stem is exceedingly slender and the leaves are strongly falciform and almost capillary. The growing plant, depending from a vine perhaps 15 feet from the ground, looked most like some delicate long pendent moss, and the resemblance of the dried specimens to certain lax forms of Sphagnum is pronounced.

**Pteris purdoniana** Maxon, sp. nov. FIGURE 1.

Fronds very large, 150 to 210 cm. long, simply pinnate, laxly arching, subfasciculate from a relatively slight decumbent or short-creeping rhizome; stipe 25 to 45 cm. long, stout, about 3.5 mm. in diameter, stramineous, villous-chaffy with numerous reduced spreading or retrorse fulvous scales, tuberculate with age; lamina 125 to 165 cm. long, 24 to 28 cm. broad, comprising about 60 or more pairs of linear-ligulate subfalcate distant pinnæ and a conform terminal segment; lower pinnæ very gradually reduced, the lowermost 2 to 4 pairs frequently vestigial, especially in the sterile fronds; characteristic middle pinnæ of fertile frond 12 to 15 cm. long, 8 or 9 mm. broad, at the base subtruncate or equally and very obtusely cuneate, falcate (especially toward the apex), the apex long-attenuate and finally serrulate; pinnæ of the sterile frond similar in shape but broader (up to 1.7 cm. broad), usually less falcate, with cartilaginous denticulate margins, the apex rather conspicuously denticulate-serrate, the base equally and obtusely cuneate; pinnæ uniformly articulate, inserted upon a con-

[a] Bull. Torr. Club **33:** 112. 1906.

spicuous mammiform basal protuberance; veins tolerably close, once-forked, evident upon the lower surface; sori continuous along both margins almost to the serrulate apex, the indusium nearly 1.5 mm. broad.

Type in the U. S. National Herbarium, nos. 520162, 520163, and 520164, these comprising a fertile frond and rhizome of a plant collected in the vicinity of Hollymount, Mount Diablo, Jamaica, altitude about 750 meters, by William R. Maxon (no. 2253), May 25 to 27, 1904; sheets no. 520165 and 520166 comprise a sterile frond with identical data. The plants grew at the border of the forest, depending gracefully from a bushy bank along the trail. Mr. Harris's no. 8882 and Dr. Underwood's no. 3458, both collected in this vicinity in 1905 and 1906, respectively, are the same.

In its vascular parts and chaffiness *P. purdoniana* resembles *P. longifolia*, of which very likely it is a derivative. It differs in a pronounced way, however, in its enormous lax arcuate fronds and especially in the falcate *articulate* pinnæ, as described. Except with great care the pinnæ are deciduous in drying, separating very readily

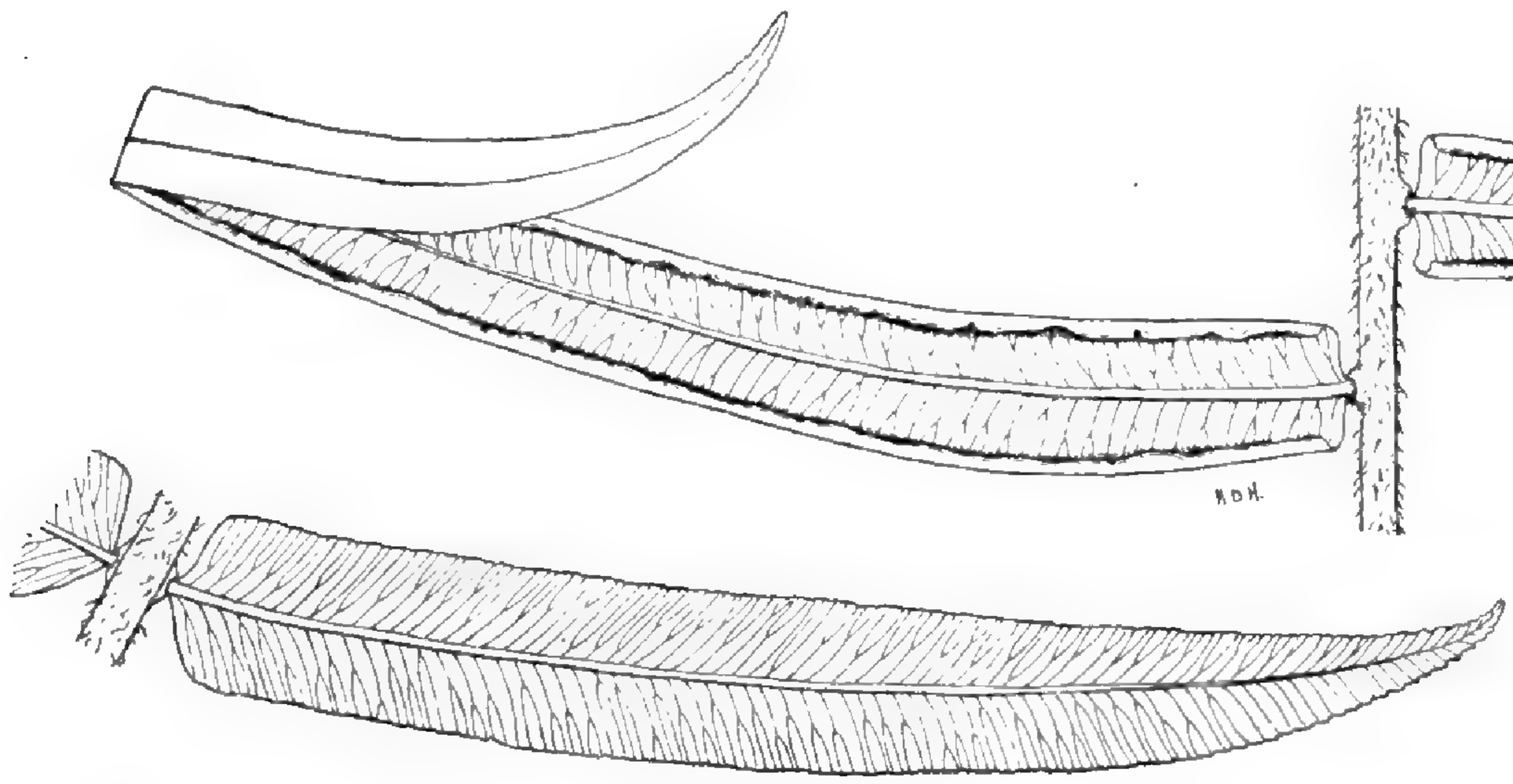


FIGURE 1.—*Pteris purdoniana*. Characteristic fertile and sterile pinnæ of type. Natural size.

at the point of insertion, as shown in the accompanying figure, which has been kindly furnished by Dr. H. D. House.

Named in honor of W. P. Purdon, esq., of Kingston, Jamaica, by whose kind permission the writer was enabled both in 1903 and 1904 to explore the vicinity of Mount Diablo, working from Hollymount, Mr. Purdon's country estate, as a base.

## MISCELLANEOUS NOTES.

**Elaphoglossum siliquoides** (Jenm.) C. Chr. Ind. Fil. 315. 1905.

*Acrostichum siliquoides* Jenm. Journ. Bot. **19:** 53. 1881.

This species, well described by Jenman upon Jamaican specimens and known previously only from that island, was collected at two localities in Alta Verapaz, Guatemala, by the writer in 1905: Above Sepacuite, on the trail to Panzos, *Maxon & Hay* 3109; Secoyoté, near Sepacuité, on rotten stumps, *Maxon & Hay* 3248. These agree perfectly with Jamaican specimens (*Maxon* 1921 and 2272), from Hollymount, altitude about 750 meters.

**Polypodium fissidens** Maxon, Contr. Nat. Herb. **8:** 275. *pl. 61. f. 4a. 4b.* 1903.

This well-marked species, described originally from Chiapas, Mexico, may now be reported from Guatemala on the basis of Selers's no. 2365, collected in the Sierra Santa Elena, Department of Chimaltenango, at an elevation of 3,000 meters—the specimens received from Captain Smith.

**Polypodium mitchellae** Baker in Hemsl. Biol. Centr. Amer. **3**: 664. 1885.

The original specimens of this species are from Orange Walk, British Honduras, *Mrs. Mitchell.* It has also been collected at Chontales, Nicaragua, by Tate (no. 406). Specimens of both these collections are at Kew and in the herbarium of the New York Botanical Garden.

The species may now be recorded also from the humid mountainous region of eastern Guatemala, on specimens collected from the trunks of forest trees near Secanquím, Alta Verapaz, at an altitude of about 450 meters, *Maxon & Hay* 3195 and 3213. It may be expected also in eastern Costa Rica, at low or middle elevations.

**Polypodium senile** Fée, 7me Mém. 60. *pl. 25. f. 1.* 1857.

A species apparently little understood, founded on Schlim's no. 364, from the province of Ocaña, New Granada. It is accredited to Colombia and Ecuador by Christensen, following Hieronymus;[a] and it appears also to extend as far north as the volcanoes of Costa Rica, on the basis of specimens which the writer for several years took to represent an undescribed species. Comparison of this northern material, however, with Colombian specimens shows no differences warranting separation. From the whole variable series, but mainly from the more complete Costa Rican material, the following description is drawn:

Plants pendent, the fronds lax, subflexuose, narrow, from a very slight rhizome, this bearing a few setose fulvous scales intermingled with long whitish hairs; stipe and rachis exceedingly delicate, wiry, flexuose, covered with long whitish or pale yellowish hairs, these radiating also in great profusion from the sori and less abundantly from the tissue of the under surface of the pinnæ; lamina slender and narrow, 15 to 25 cm. long, 8 to 15 mm. wide, comprising from 30 to 50 pairs of pinnæ, these distant or their own width apart (rarely approximate); larger pinnæ of mature fronds 7 to 9 mm. long, 2.5 to 3.5 mm. broad, narrowly oblong or infrequently subovate with a rounded basal auricle, narrowed at the base, partially adnate or rarely subsessile, the extent of adnation commonly about one-half the maximum width of the pinna, the margins entire or slightly sinuate; lower pinnæ gradually smaller, the lowermost 4 or 5 pairs vestigial, minute, 6 to 8 mm. apart; sori of characteristic pinnæ about 6 pairs, contiguous, strongly confluent with age, borne nearer to the midvein than to the margin at the extremity of the short subopposite simple blackish veinlets.

The following specimens have been examined:

COLOMBIA: Sierra del Libano, Santa Marta, altitude 1,650 meters, damp forest on a ridge, pendent from branches of trees, *H. H. Smith* 2230 (Y). Cerro de Onaca, Santa Marta, altitude 1,650 meters, on a tree, *H. H. Smith* 2437 (Y). Sierra del Libano, Santa Marta, altitude about 1,800 meters, damp forest, on trees, hanging from the branches and often hidden among mosses and Hymenophyllaceae, *H. H. Smith* 1035 (Y). Without special locality, *Lindig* (Y).

COSTA RICA: Volcan de Turrialba, altitude 2,600 to 2,800 meters, *Pittier* 13248 (*J. D. S.* 7497) (N). Forêts de l'Achiote, Volcan de Poas, altitude 2,200 meters, *Tonduz* 10706 (N). Forêts du Volcan du Barba, altitude 2,500 meters, *Tonduz* 1934 (N). Massif de l'Irazu, altitude about 2,000 meters, *Tonduz* 4180 (N). Without locality, *Werckle*, ex herb. Christ (N).

The Costa Rican specimens show a tendency to have the pinnæ more spaced and less adnate to the rachis than those from Colombia, the best development being represented by Mr. Pittier's no. 13248. Mr. H. H. Smith's no. 1035 is the most mature state of the Colombian specimens.

From *P. cultratum* the present species is readily distinguished by (1) its dark venation, the branches of the midvein being blackish (green in *P. cultratum*), (2) its spaced, less adnate, even subsessile pinnæ, these not recurved, (3) its more copious hairy covering, this much lighter in color, and (4) its more slender vascular parts.

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[a] See Hieronymus in Engler's Bot. Jahrb. **34:** 508. 1905.

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SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

# CONTRIBUTIONS

FROM THE

# UNITED STATES NATIONAL HERBARIUM

VOLUME 13, PART 2

# THREE NEW SPECIES OF ECHEVERIA FROM SOUTHERN MEXICO

By J. N. ROSE and J. A. PURPUS

WASHINGTON
GOVERNMENT PRINTING OFFICE
1910

BULLETIN OF THE UNITED STATES NATIONAL MUSEUM:

ISSUED FEBRUARY 21, 1910.

# PREFACE.

This paper, prepared by Dr. J. N. Rose in cooperation with J. A. Purpus of the Darmstadt Botanical Garden, Germany, contains the descriptions of three interesting new species of Echeveria from southern Mexico. The beauty of two of these is such as to warrant their introduction into ornamental cultivation along with many other beautiful and striking species of Echeveria which have been discovered in Mexico during the last few years.

FREDERICK V. COVILLE,
*Curator of the United States National Herbarium.*

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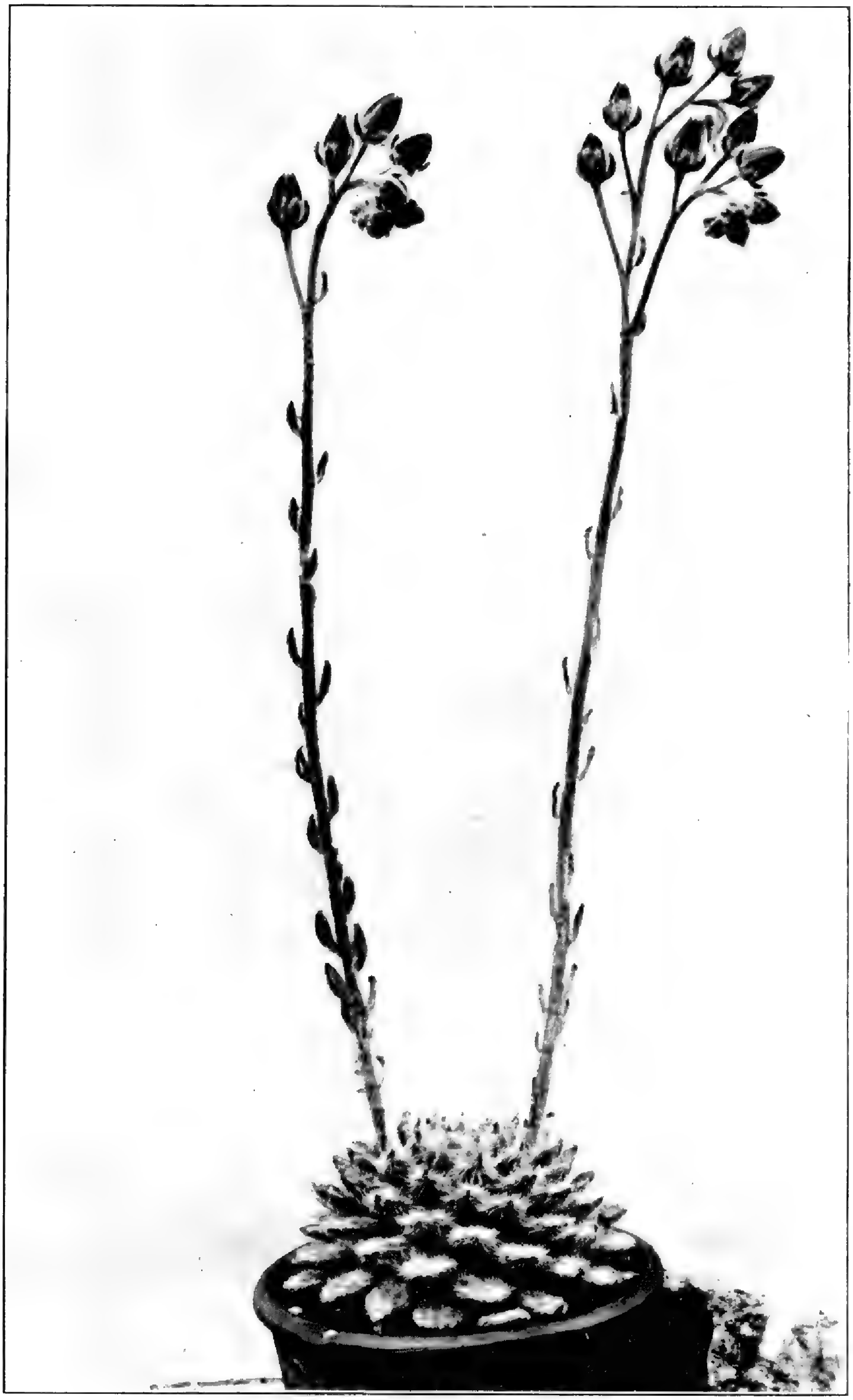

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ECHEVERIA SETOSA ROSE & PURPUS.



ECHEVERIA SUBALPINA ROSE & PURPUS.

# THREE NEW SPECIES OF ECHEVERIA FROM SOUTHERN MEXICO.[a]

By J. N. Rose and J. A. Purpus.

Dr. C. A. Purpus spent much time during 1907 and 1908 on the high mountains of Puebla, especially near San Luis Tultitlanapa, near the border of Oaxaca, Mexico, and on the peak of Orizaba, where he collected numerous interesting succulents. Living plants were sent both to Washington, D. C., and to Darmstadt, Germany. Three species have been recognized independently by the writers in this material, and these are here described jointly by them. All three of the species have flowered at Darmstadt, and one of them, *E. gigantea*, has flowered frequently in Washington, maturing seed which has afforded numerous seedlings. The red-margined leaves form beautiful rosettes, and the species would doubtless prove to be a good bedding plant. *Echeveria subalpina*, also, belonging to the *E. glauca* type, ought to furnish suitable material for flat bedding.

**Echeveria setosa** Rose & Purpus, sp. nov. PLATE 10.

Acaulescent giving out offsets from the base; leaves 100 or more, forming dense, almost globular rosettes (10 to 12 cm. in diameter), thickish but flattened, spatulate to oblanceolate, 4 to 5 cm. long with an ovate, acute tip, slightly ridged along the middle both above and below, covered on both sides with setiform hairs; flowering stems setose, 20 to 30 cm. high, bearing small bract-like setose leaves; inflorescence usually simple, consisting of an 8 to 10-flowered secund raceme; lower pedicels 2 to 3 cm. long; sepals green, linear, setose, spreading; petals 10 to 15 mm. long, red at base, yellow at tip, smooth within, short-setose without; stamens white; styles greenish.

Collected by Dr. C. A. Purpus on rock, Cerro de la Yerba, near San Luis Tultitlanapa, Puebla, in 1907, and grown both in Washington, D. C. and at Darmstadt, Germany, flowering at the latter place in 1909.

Type U. S. National Herbarium no. 592487.

EXPLANATION OF PLATE 10. Flowering plant. From a photograph by J. A. Purpus.

**Echeveria subalpina** Rose & Purpus, sp. nov. PLATE 11.

Acaulescent; leaves arranged in open rosettes (20 to 25 cm. in diameter), linear-lanceolate, with reddish attenuate tips, 7 to 10 cm. long, 1.5 to 2 cm. broad, very glaucous; flowering stem simple, rarely 2-branched, bearing few bract-like leaves;

[a] Three of the illustrations here used have been furnished by J. A. Purpus, Curator of the Botanical Garden at Darmstadt.

inflorescence a secund raceme, 8 to 20-flowered; pedicels very short, hardly elongating in age; sepals ascending; corolla 12 mm. long, cinnabar red without, yellowish within; petals blunt, yellowish-margined; stamens yellow; stigmas bright green.

Collected by Dr. C. A. Purpus in the subalpine regions of Orizaba in 1907.

Type U. S. National Herbarium no. 592489.

EXPLANATION OF PLATE 11.—Flowering plant. From a photograph by J. A. Purpus.

**Echeveria gigantea** Rose & Purpus, sp. nov. PLATES 12-14.

Main stem short and stocky, 20 to 30 cm. long, crowned by a rosette of leaves; leaves oblanceolate, sometimes 25 cm. long, 15 cm. broad at widest point, tapering below into a thick fleshy petiole, light green, only slightly glaucous, bordered by a bright red margin; flowering stems erect, sometimes nearly 2 meters long, somewhat pinkish, glaucous, the longer leaves 10 to 11 cm. long; inflorescence paniculate, with elongated ascending branches, often 15 to 30 cm. long; pedicels usually short (2 to 5 mm. long), but the earlier ones often longer; sepals very unequal, spreading and remaining so after the flower fades; corolla 12 to 14 mm. long, pinkish, the lobes slightly spreading at tip.

Collected by C. A. Purpus, in the arroyos of the Cerro de la Yerba, near San Luis Tultitlanapa, Puebla, in 1907 (no. 414), and flowered in Washington in 1909 and again in September to November of the same year.

Type U. S. National Herbarium no. 592488.

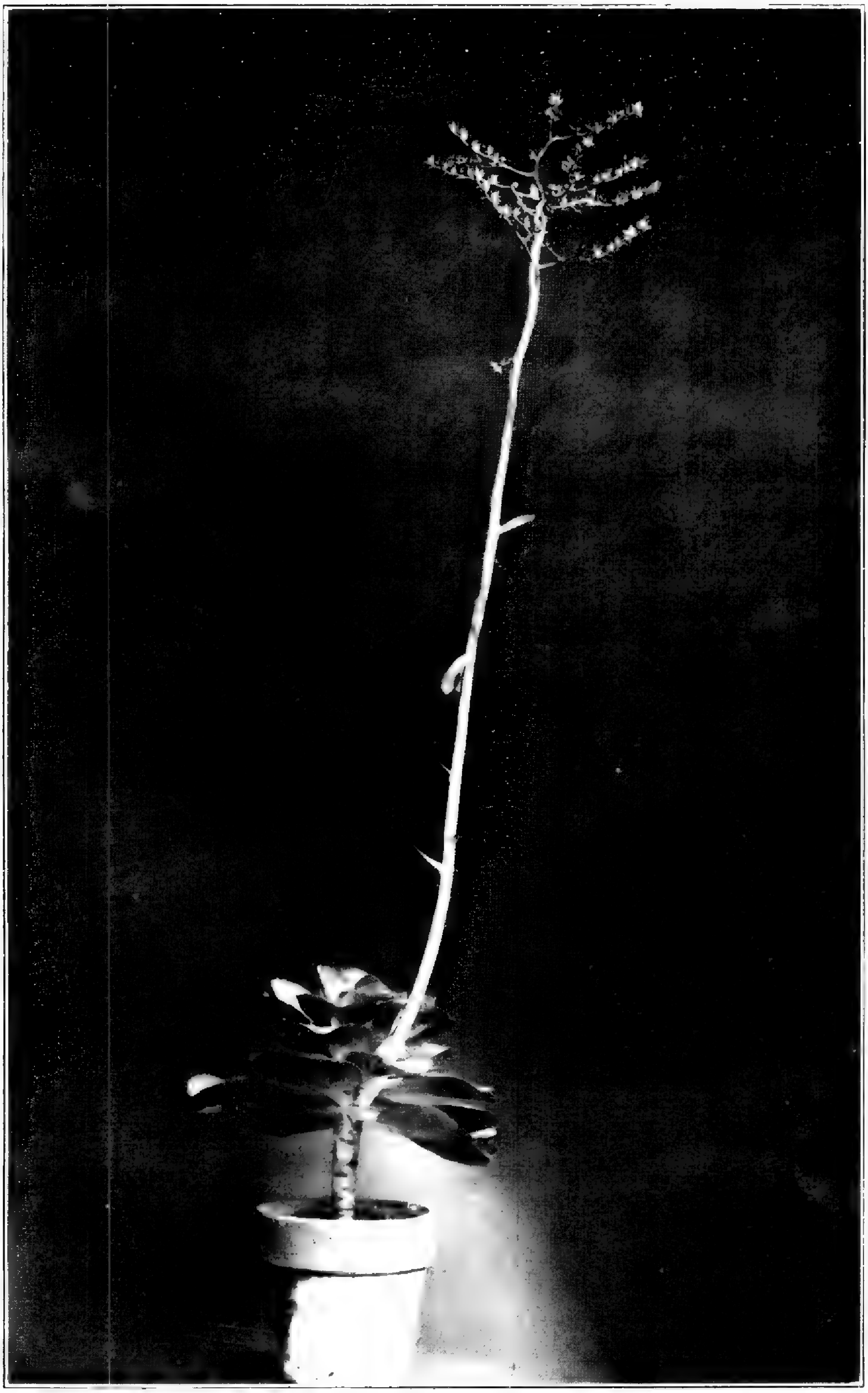
EXPLANATION OF PLATES 12-14.—Plate 12, plant in flower. From a photograph by J. A. Purpus. Plate 13, a rosette viewed from above. From a photograph of a plant in the Department of Agriculture greenhouses at Washington. Plate 14, fruiting plant. Same data as last.



ECHEVERIA GIGANTEA ROSE & PURPUS.



ROSETTE OF ECHEVERIA GIGANTEA ROSE & PURPUS.



ECHEVERIA GIGANTEA ROSE & PURPUS.

SMITHSONIAN INSTITUTION

UNITED STATES NATIONAL MUSEUM

# CONTRIBUTIONS

FROM THE

# UNITED STATES NATIONAL HERBARIUM

VOLUME 13, PART 3

# THE GRASSES OF ALASKA

By F. LAMSON-SCRIBNER and
ELMER D. MERRILL




WASHINGTON
GOVERNMENT PRINTING OFFICE
1910

BULLETIN OF THE UNITED STATES NATIONAL MUSEUM.

ISSUED JUNE 8, 1910.

# PREFACE.

The grasses of Alaska are of great interest, not only from the standpoint of technical botanical science, but because they form one of the great natural resources of that region, as yet little utilized. Although many lists of grasses from Alaskan localities have been published, no comprehensive and critical work on the whole subject exists. The present paper, prepared by Professor F. Lamson-Scribner and Mr. Elmer D. Merrill, brings our knowledge up to date and will serve as a working basis for the study of Alaskan grasses until that vast region has been more fully explored and its vegetation more thoroughly investigated.

FREDERICK V. COVILLE,

*Curator of the United States National Herbarium.*

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# THE GRASSES OF ALASKA.

By F. Lamson-Scribner and Elmer D. Merrill.

## INTRODUCTION.

In the present paper all the species of grasses which have been credited to Alaska are noted, but it has been impossible to identify positively some of those described by the older authors. In some of the published lists of Alaskan grasses there are species credited to the territory which certainly do not occur in that region. This has resulted from erroneous determinations or misconceptions of the species. In some cases it has been possible properly to refer these, as the material on which several of the lists were based is in the National Herbarium; in others, however, we have been unable even to conjecture what an author had at hand. In cases where the species are well authenticated they have been admitted here even though we have seen no Alaskan material representing them.

In 1830 Presl published the first volume of his "Reliquiae Haenkeanae," which contains the descriptions of many new species from Nootka Sound, Vancouver Island. This is practically the beginning of the systematic botany of the Pacific Northwest. In 1832 Bongard published his "Observations sur la Vegetation de l'ile de Sitcha."[a] Earlier in the same series Trinius described[b] many species of grasses based on Alaskan material, although he had published a few Alaskan species in previous works. The next work of importance on the Alaskan flora, and the last one during the Russian occupancy, was Ledebour's "Flora Rossica," which contains many references to, and descriptions of, new species from Russian North America, the grasses of this work being by Grisebach, and contained in volume 4.[c] With one or two exceptions, practically all the publications of the Alaskan grasses since that of Grisebach are by American botanists and consist of mere lists and miscellaneous descriptions of new species.

Comparatively little is known regarding the distribution of many of the species in Alaska, for some are represented in collections by only one or two specimens; then, too, nearly all our material is from the coast region, very few botanists having ventured into the vast and

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[a] See bibliography, p. 91.

[b] Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **1:** 54–93, 353–416. 1830.

[c] Pages 324–466. 1853.

practically unknown regions of the interior. It is from the latter regions mainly that additions to the Alaskan flora are to be expected in the future. It has been impossible to determine the habitat of many of the species herein enumerated, as most collectors have neglected to furnish any data other than the locality and date of collection. Notable exceptions to this general lack of data are found in the fine collections made by W. H. Evans during the years 1897 and 1898, and by F. H. Walpole in 1901.

Under critical species are cited the specimens, found in the U. S. National Herbarium, upon which the enumeration is based. These include those from Alaska and also those from the adjacent Yukon Territory of the Dominion of Canada, the flora of which, by the course of the Yukon River, is rendered geographically continuous with the former. The following are some of the more important of the collections: C. Wright, 1853–1856; A. Kellogg, 1868; M. W. Harrington, 1871–72; L. M. Turner, 1880; C. L. McKay, 1881; Doctor Murdock, 1882; O. S. Bates, 1889; C. Hart Merriam, 1891; W. G. Wright, 1891; J. M. Macoun, 1891, 1896, 1897; B. W. Evermann, 1892; Frederick Funston, 1892; Thomas Howell, 1895; W. H. Evans, 1897, 1898; R. S. Williams, 1899; E. F. Glenn, 1899; F. C. Schrader, 1899; J. B. Tarleton, 1899; C. C. Georgeson, 1898, 1900; F. E. Blaisdell, 1900; J. B. Flett, 1900; F. A. Walpole, 1901; C. V. Piper, 1904; and the material secured by the Harriman Alaskan Exploring Expedition, 1899, by the following botanists: Frederick V. Coville and Thomas H. Kearney; William Trelease and De Alton Saunders; W. H. Brewer and W. R. Coe; T. Kincaid; and L. J. Cole. In addition to these collections, we have had a few specimens from the earlier Russian collectors, representing several of Trinius's species, and some from other collectors whose names are given wherever their specimens are cited.

The systematic distr.bution of the Alaskan grasses as a whole is very interesting. At this date not a native or introduced species of the series Panicaceae is known from Alaska, the tribes Maydeae, Andropogoneae, Osterdamieae, Tristegineae, Paniceae, and Oryzeae being thus eliminated, while on the other hand all the tribes of the series Poaceae are represented except the Bambuseae. Of these tribes Phalarideae has one genus, Savastana; Agrostideae, 9 genera, Stipa, Phleum, Alopecurus, Phippsia, Arctagrostis, Cinna, Agrostis, Podagrostis, and Calamagrostis; Aveneae, 3 genera, Deschampsia, Trisetum and Avena; Chlorideae one genus, Beckmannia; Festuceae, 10 genera, Catabrosa, Melica, Dactylis, Poa, Colpodium, Dupontia, Panicularia, Puccinellia, Festuca, and Bromus, while Hordeae has 3 genera, Agropyron, Hordeum, and Elymus. The genus Poa is represented by the greatest number of species. Under the 27 genera considered there are here enumerated and described 104 species and 18 subspecies. There are 10 species proposed as new to science.

## SYSTEMATIC TREATMENT.

### POACEAE (Grasses.)

Fibrous-rooted, annual or perennial, herbaceous (rarely woody) plants, with usually hollow, cylindrical (rarely flattened), and jointed stems (culms), the internodes for more or less of their length enveloped by the sheath-like basal portion of the two-ranked and usually linear, parallel-veined leaves; flowers without any distinct perianth, hermaphrodite or rarely unisexual, solitary or several together, in spikelets, which are arranged in panicles, racemes, or spikes; spikelets consisting of a shortened axis (the rachilla) and two or more chaff-like, distichous, imbricated bracts (glumes), of these the first two, rarely one or none or more than two, empty (empty glumes); borne in the axil of each of the succeeding bracts (excepting sometimes the uppermost) a flower (the bracts hence named flowering glumes or lemmas); opposed to each lemma, with its back turned toward the rachilla, usually a two-nerved, two-keeled bract or prophyllum (the palea), this frequently enveloping the flower by its infolded edges; at the base of the flower, between it and its glume, usually two very small hyaline scales (lodicules), with rarely a third lodicule between the flower and the palea; stamens, usually three (rarely two or one, or more than three), with very slender filaments and two-celled, usually versatile, anthers; pistil with a one-celled, one-ovuled ovary, and one to three, usually two, styles, with variously branched, most frequently plumose, stigmas; embryo small, lying at the front and base of the seed, covered only by the thin pericarp; fruit a caryopsis, rich in albumen.

The characters employed in defining the tribes and genera are usually those presented by the spikelets or inflorescence. While the characters of the order are well defined the establishment of the several subdivisions is very difficult, and in no case can be based upon a single character, but only upon a combination of them. There is no one tribe or large genus which can be separated absolutely from all others, there are always exceptions or intermediate forms connecting them, and the same statement is largely true of many of the species, especially in the genera Poa and Festuca.

#### KEY TO THE TRIBES AND GENERA.

Spikelets distinctly pedicellate, racemose or paniculate;
  panicles sometimes contracted and spike-like.
    The first and second florets in each spikelet staminate or imperfect..... Tribe I. **PHALARIDEAE.**
    The lowest florets perfect, the imperfect flowers, if any, uppermost.
      Spikelets one-flowered..... Tribe II. **AGROSTIDEAE.**
      Spikelets two to many-flowered.
        Lemmas awned on the back; glumes longer than the lemmas..... Tribe III. **AVENEAE.**
        Lemmas awnless or with a terminal awn, glumes usually shorter than the lemmas. Tribe V. **FESTUCEAE.**
Spikelets sessile in spikes.
    Spikes unilateral..... Tribe IV. **CHLORIDEAE.**
    Spikes not unilateral..... Tribe VI. **HORDEAE.**

#### Tribe I. **PHALARIDEAE.**

Glumes nearly equal, scarcely exceeding the lemmas, which are awnless or very short-awned..... 1. SAVASTANA.

### Tribe II. **AGROSTIDEAE.**

Lemmas awned or mucronate-pointed.
- Awn terminal.
  - Awn much exceeding and articulated with the lemma. 2. STIPA.
  - Awn very short, not articulated with the lemma ..... 7. CINNA.
- Awn dorsal.
  - Rachilla prolonged behind the palea into a slender, usually plumose or hairy bristle.
    - Awn very minute, attached near the apex of the lemma..... 9. PODAGROSTIS.
    - Awn longer, attached at or below the middle of the lemma..... 10. CALAMAGROSTIS.
  - Rachilla not prolonged behind the palea.
    - Inflorescence an open panicle..... 8. AGROSTIS.
    - Inflorescence a dense cylindrical spike-like panicle. 4. ALOPECURUS.

Lemmas awnless.
- Rachilla prolonged behind the palea into a short, naked bristle..... 6. ARCTAGROSTIS.
- Rachilla not prolonged behind the palea.
  - Lemmas mostly shorter than the glumes.
    - Glumes abruptly awn-pointed; inflorescence a dense cylindrical panicle..... 3. PHLEUM.
    - Glumes acute; inflorescence not in dense cylindrical panicles..... 8. AGROSTIS.
  - Lemmas much exceeding the minute glumes..... 5. PHIPPSIA.

### Tribe III. **AVENEAE.**

Lemmas awned from below the middle..... 11. DESCHAMPSIA.

Lemmas awned from above the middle.
- Rachilla prolonged as a sterile pedicel, lemma bearing a dorsal, twisted awn..... 12. TRISETUM.
- Rachilla not prolonged, lemma bearing a straight awn just below the apex..... 13. AVENA.

### Tribe IV. **CHLORIDEAE.**

Spikelets sessile, closely imbricated in two rows along the short branches of the panicle, the glumes equal, inflated, and rounded on the back..... 14. BECKMANNIA.

### Tribe V. **FESTUCEAE.**

Lemmas 1 to 3-nerved or nerveless.
- Callus or base of the lemma hairy or barbate; glumes glabrous, acute..... 19. COLPODIUM.
- Callus and base of the lemma glabrous; glumes obtuse, scarious..... 15. CATABROSA.

Lemmas 5 to many-nerved.
Spikelets nearly sessile in dense one-sided clusters at the ends of the few panicle branches..... 17. DACTYLIS.
Spikelets not in dense one-sided clusters at the ends of the panicle branches.
Callus barbate or pilose.
Panicles erect, strict, the rigid branches usually divergent..... 20. DUPONTIA.
Panicles nodding, the spreading branches usually capillary..... 19. COLPODIUM.
Callus naked.
Lemmas rounded on the back.
Nerves of the lemmas prominent.
Lemmas long acuminate pointed..... 16. MELICA.
Lemmas obtuse..... 21. PANICULARIA.
Nerves of the lemmas obscure or manifest only near the apex.
Lemmas obtuse, awnless.
Glumes usually small and distinctly shorter than the lemmas. Grasses of alkali plains and the seashore.... 22. PUCCINELLIA.
Glumes usually about as long as the nearest lemma, the latter more or less pubescent..... 18. POA.
Lemmas acute or obtuse, often awned.
Lemmas acute or awned from the apex..... 23. FESTUCA.
Lemmas obtuse, usually awned just below the apex..... 24. BROMUS.
Lemmas compressed-keeled.
Spikelets 1 to 2 cm. or more in length, short-awned..... 24. BROMUS.
Spikelets less than 1 cm. long, awnless; lemmas usually with a tuft of cobwebby hairs at the base..... 18. POA.

## Tribe VI. **HORDEAE.**

Spikelets solitary at each node of the rachis..... 25. AGROPYRON.
Spikelets 2 or 3 at each node of the rachis.
Spikelets 3 at each node of the rachis, 1-flowered..... 26. HORDEUM.
Spikelets 2 at each node of the rachis, several-flowered.... 27. ELYMUS.

### 1. **SAVASTANA** Schrank.

*Savastana* Schrank, Baier. Fl. **1**: 100. 337. 1789.
*Hierochloë* J.G. Gmelin, Fl. Sibir. **1**: 101. 1747.

Spikelets 3-flowered, the terminal flower hermaphrodite, the others staminate; rachilla articulated above the glumes; glumes subequal, glabrous, equaling the spikelet; lemmas awnless or short-awned. Fragrant perennial grasses with flat leaves and terminal panicles.

First and second lemmas awned..... 1. *S. alpina.*
First and second lemmas awnless.
Lemmas entire; culms 30 to 60 cm. high; panicles ample..... 2. *S. odorata.*
Lemmas erose-truncate; culms 15 cm. high or less; panicles very narrow, few-flowered..... 3. *S. pauciflora.*

1. **Savastana alpina** (Liljebl.) Scribn. Mem. Torrey Club **5:** 34. 1894.
*Aira alpina* Liljebl. Utk. Svensk Fl. ed. 2. 41. 1798.
*Hierochloë alpina* Roem. & Schult. Syst. Veg. **2:** 515. 1817.

A slender, glabrous, erect grass 15 to 45 cm. high with narrow, flat leaves, and contracted panicles 1.5 to 3 cm. long; glumes subequal, glabrous; lemmas ciliate on the margins, the first bearing an awn about 2 mm. long, the second with a more or less bent and twisted awn about 6 mm. long.

Seward Peninsula and the islands of Bering Sea to the Shumagin Islands and White Pass in southeastern Alaska, and eastward and southward to Greenland and the mountains of New England and New York; also in northern Europe and Asia.

2. **Savastana odorata** (L.) Scribn. Mem. Torrey Club **5:** 34. 1894. VANILLA GRASS.
*Holcus odoratus* L. Sp. Pl. 1048. 1753.
*Hierochloë borealis* Roem. & Schult. Syst. Veg. **2:** 513. 1817.

A slender stoloniferous grass, 30 to 60 cm. high with short culm leaves and brownish, open panicles 4 to 10 cm. long; spikelets 4 to 6 mm. long; glumes glabrous, subequal; lemmas hairy, acute, not awned. The flat leaves of the sterile shoots are 10 to 30 cm. long.

In damp soil, Seward Peninsula and the Aleutian Islands to southeastern Alaska; also on the upper Yukon, thence to Newfoundland, New York, and Minnesota, and in the Rocky Mountains to Mexico.

3. **Savastana pauciflora** (R. Br.) Scribn. Mem. Torrey Club **5:** 353. 1894.
*Hierochloë pauciflora* R. Br. Suppl. App. Parry's Voy. 293. 1824.

A slender, erect, glabrous species, 10 to 20 cm. high, with short leaves, small, few-flowered panicles, and awnless spikelets; sheaths mostly at the base of the culm, overlapping; basal leaves 2 to 5 cm. long or less; spikelets few, 3 to 4 mm. long; lemmas scabrous, erose-truncate, the third shorter than the others, obtuse, villous at the apex.

Seward Peninsula and the Pribilof Islands; also in the arctic region of both North America and Asia.

SPECIMENS EXAMINED: Port Clarence, tundra near Teller Reindeer Station, *Walpole* 1781; St. Paul Island, Bering Sea, in marshes, *Macoun* in 1892.

## 2. STIPA L.

*Stipa* L. Sp. Pl. 78. 1753.

Spikelets 1-flowered; rachilla articulated above the glumes and produced below the lemma into a strong, bearded, obconical and sharp-pointed callus; glumes thin subequal, acuminate, exceeding the lemma, this narrow and closely rolled around the flower, and terminating in a twisted, geniculate, simple awn articulated with its summit. Tufted perennial grasses with narrow involute leaves and usually open panicles.

1. **Stipa comata** Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. **5:** 75. 1842. PORCUPINE GRASS.

An erect, cespitose species, 30 to 90 cm. high, with involute leaves and loosely flowered panicles 15 to 25 cm. long; glumes long attenuate pointed, about 24 mm. long; lemma thinly pubescent, about 12 mm. long, bearing a slender flexuous awn 8 to 10 cm. in length.

In dry or sandy soil in the upper Yukon valley, thence to California and Nebraska.

SPECIMEN EXAMINED: Five Finger Rapids, Yukon River, *Tarleton* 85.

## 3. PHLEUM L.

*Phleum* L. Sp. Pl. 59. 1753.

Spikelets 1-flowered, hermaphrodite; rachilla articulated above the glumes, not prolonged beyond the floret; glumes 2, compressed-carinate, usually ciliate on the keels and abruptly mucronate-pointed; lemma shorter than the glumes, thin, truncate, awnless. Annual or perennial grasses with simple erect culms and dense cylindrical or oblong spike-like panicles.

Panicles elongated, cylindrical; awns less than one-half the length of the glumes; upper sheath not inflated; culm from a bulbous base.. 1. *P. pratense.*
Panicles not elongated, ovoid or oblong; awns about one-half the length of the glumes; upper sheath inflated; culms not bulbous at the base..... 2. *P. alpinum.*

1. **Phleum pratense** L. Sp. Pl. 59. 1753. TIMOTHY.

A simple, erect, tufted perennial, 30 to 120 cm. high with dense, cylindrical, spike-like panicles 2.5 to 10 cm. long.

Kodiak Island to Juneau and Wrangell in southeastern Alaska, east to Newfoundland and southward, also in Asia. Widely cultivated and completely naturalized in fields and waste grounds.

Dr. Kellogg states that this grass was growing luxuriantly at Fort Simpson, in thick-lodged masses, without care or culture.

2. **Phleum alpinum** L. Sp. Pl. 59. 1753. MOUNTAIN TIMOTHY.

*Phleum haenkeanum* Presl, Rel. Haenk. **1**: 245. 1830.

A glabrous, erect perennial 15 cm. high, with ovoid or oblong spike-like panicles 1 to 5 cm. long.

Moist soils on the Pribilof and Aleutian islands, and on the main land from Nushagak to southeastern Alaska, eastward to Labrador, and southward in the mountains to New England, Arizona, and California; also in Europe, Asia, and South America.

Mr. Nash[a] doubtfully refers a specimen collected by R. S. Williams at Dawson to *Phleum haenkeanum* Presl, but we can find no valid characters by which this species can be distinguished from *Phleum alpinum*, and here consider it only as a synonym of the latter species.

## 4. ALOPECURUS L.

*Alopecurus* L. Sp. Pl. 60. 1753.

Spikelets 1-flowered, strongly flattened; rachilla articulated below the equal glumes, more or less ciliate, especially along the keels, usually connate at the base; lemma hyaline, obtuse, usually awned on the back. Annual or perennial grasses, with erect or ascending culms, flat leaves, and densely flowered cylindrical or ovoid, spike-like panicles.

Plants slender; panicles cylindrical, 5 to 7 mm. in diameter; spikelets somewhat pubescent, 2 mm. long.
Awn exserted, exceeding the glumes..... 1. *A. geniculatus.*
Awn not exserted, equaling or shorter than the glumes..... 1a. *A. geniculatus fulvus.*
Plants stout; panicles ovate, 10 to 15 mm. in diameter, spikelets 4 to 6 mm. long, densely villous.
Panicles about 1 cm. in diameter; spikelets 4 mm. long; glumes obtuse..... 2. *A. alpinus.*
Panicles 1.5 cm. in diameter; spikelets 6 mm. long; glumes acute..... 3. *A. stejnegeri.*

1. **Alopecurus geniculatus** L. Sp. Pl. 60. 1753.

A slender perennial 15 to 50 cm. high, with culms decumbent and branched at the base, often inflated sheaths, spreading leaves, and slender spike-like panicles 2.5 to 7.5 cm. long, spikelets 2 mm. long, silky-hairy on the keels; lemma awned from near the base, the awn slender, about twice as long as the glumes.

Wet meadows, banks of streams, and ditches at Kodiak Island and Yakutat Bay, eastward to Newfoundland, and throughout the United States; also in Asia.

SPECIMENS EXAMINED: Kodiak, *Evans* 377, *Cole* in 1899, *Trelease & Saunders* 2899; Yakutat, *Trelease & Saunders* 2898.

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[a] Bull. N. Y. Bot. Gard. **2**: 150. 1901.

1a. **Alopecurus geniculatus fulvus** (J. E. Smith) Richter, Pl. Eur. **1:** 38. 1890.

*Alopecurus fulvus* J. E. Smith in Sowerby, Engl. Bot. *pl. 1467*. 1793.

*Alopecurus aristulatus* Michx. Fl. Bor. Amer. **1:** 43. 1803.

*Alopecurus howellii merrimani* Beal, Grasses N. Amer. **2:** 278. 1896.

*Alopecurus howellii merriami* Macoun in Jordan, Fur Seals North Pacif. **3:** 573. 1899.

Distribution similar to that of the species.

SPECIMENS EXAMINED: Kodiak, *Evans* 377a; Fort Selkirk, *Tarleton* 121; St. George Island, *Merriam* in 1891; St. Paul Island, *Macoun* 16636, *Palmer;* Unga, *Piper* 4718.

The specimens collected by Merriam and Macoun cited above represent the form described by Beal as *Alopecurus howellii* var. *merrimani*, which differs from typical *Alopecurus geniculatus fulvus* only in its low stature and shorter spikes, characters due only to habitat, as both specimens cited above were collected in bare dry soil.

2. **Alopecurus alpinus** J. E. Smith in Sowerby, Engl. Bot. *pl. 1126*. 1793.

A glabrous, erect perennial 10 to 60 cm. high, with flat leaves and cylindrical or ovoid, densely flowered spike-like panicles 1 to 3 cm. long; spikelets 4 mm. long with obtuse, densely villous glumes, about the length of the lemma, this bearing on the back just below the middle a slender awn that equals or somewhat exceeds it in length.

Arctic Alaska and the islands of Bering Sea to Cook Inlet and the upper Yukon, thence eastward to Labrador; also in the arctic regions of Europe and Asia.

3. **Alopecurus stejnegeri** Vasey, Proc. U. S. Nat. Mus. **10:** 153. 1887.

A stout perennial 15 to 30 cm. high, the culms decumbent and geniculate below, with inflated sheaths, conspicuous ligule, and ovoid or oblong, densely pubescent, spike-like panicles 2 to 4 cm. long; glumes lanceolate, densely villous, about one-third longer than the lemma, this 4 mm. in length and bearing an awn near the base which equals or slightly exceeds the glumes.

The type specimens were collected at South Rookery, Bering Islands, and at Karabelnij on Copper Island, in Russian territory, by L. Stejneger, August 21, 1882, and the species will doubtless be found within the American limits.

## 5. PHIPPSIA R. Br.

*Phippsia* R. Br. Suppl. App. Parry's Voy. 275. 1824.

Spikelets 1-flowered, hermaphrodite, very small; glumes minute, unequal, or the first sometimes wanting; lemma thin-membranaceous, somewhat carinate, with the apex irregularly dentate, awnless. A dwarf perennial, with narrow, flat leaves, which are scarcely exceeded by the very slender, few-flowered panicles.

1. **Phippsia algida** (Soland.) R. Br. Suppl. App. Parry's Voy. 275. 1824.

*Agrostis algida* Soland. in Phipps, Voy. 200. 1774.

A low, tufted, glabrous grass 2 to 10 cm. high, with narrow, soft leaves and contracted simple panicles; spikelets 1 to 1.5 mm. long; glumes minute, unequal, acute, the lemma broad and obtuse or erose-truncate.

Islands of Bering Sea, arctic North America, and on the highest mountain peaks of Colorado; also in northern Europe and Asia.

SPECIMENS EXAMINED: St. Paul Island, *Palmer* 459; St. Matthew Island, *Coville & Kearney* 2106; St. Lawrence Island, *Coville & Kearney* 1994.

## 6. ARCTAGROSTIS Griseb.

*Arctagrostis* Griseb. in Ledeb. Fl. Ross. **4:** 434. 1853.

Spikelets 1-flowered, hermaphrodite; glumes 2, usually unequal, acute, awnless; lemmas usually a little longer than the glumes, obtuse or subdentate at the apex, imperfectly 5-nerved, awnless. Perennial cespitose grasses, with flat leaves and contracted or open, terminal panicles of rather large spikelets.

Plants 15 to 40 cm. high with contracted, densely flowered panicles..... 1. *A. latifolia.*
Plants 60 to 120 cm. high with usually open, loosely flowered panicles..... 2. *A. arundinacea.*

1. **Arctagrostis latifolia** (R. Br.) Griseb. in Ledeb. Fl. Ross. **4:** 434. 1853.
*Colpodium latifolium* R. Br. Suppl. App. Parry's Voy. 286. 1824.
A rather stout, erect, glabrous grass with erect or ascending leaves and contracted, usually purplish, rather densely flowered panicles 3 to 10 cm. long, the appressed branches 3 to 5 cm. long, and mostly flower-bearing to the base; leaf blades 10 to 15 cm. long, 6 to 12 mm. wide; spikelets 3 to 5 mm. long; glumes unequal, shorter than the obtuse, scabrous lemma.

In damp soils, arctic Alaska, and the islands of Bering Sea to Cook Inlet, and eastward to Labrador and Greenland; also in northern Europe and Asia.

2. **Arctagrostis arundinacea** (Trin.) Beal, Grasses N. Amer. **2:** 317. 1896.
*Vilfa arundinacea* Trin. Gram. Unifl. 157. 1824.
A stout, erect perennial, 60 to 120 cm. high with flat leaves and usually open, diffusely flowered panicles, 15 to 35 cm. long; leaves scabrous, 15 to 25 cm. long, about 10 mm. wide; panicles pale or purplish, the branches fasciculate, spreading or ascending, often 6 to 10 cm. long, spikelets 2.5 to 6 mm. long.

In wet soils throughout Alaska and in British America and northeast Asia.

Trinius has an excellent illustration of this species[a] and there can be no doubt as to the identity of the plant. It is, however, an exceedingly variable species, especially in vegetative characters. We have been unable to distinguish *Arctagrostis angustifolia* Nash. The specimen in the National Herbarium collected by R. S. Williams is certainly *A. arundinacea,* although it is cited in the original description of *A. angustifolia.*

## 7. CINNA L.

*Cinna* L. Sp. Pl. 5. 1753.
Spikelets 1-flowered; rachilla distinctly articulated below the glumes as well as above them, produced below the floret into a short smooth stipe, and usually extending behind the palea as a slender naked bristle; lemma similar to the glumes, 3-nerved, usually with a short, subterminal awn. Tall perennial grasses with numerous flat leaves and many-flowered, nodding panicles.

1. **Cinna latifolia** (Trev.) Griseb. in Ledeb. Fl. Ross. **4:** 435. 1853.
*Agrostis latifolia* Trev. in Göpp. Beschr. Bot. Gart. Breslau 82. 1830.
*Muhlenbergia pendula* Bong. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **2:** 172. 1832.
*Cinna pendula* Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. **4:** 280. 1841.
*Cinna arundinacea pendula* A. Gray, Man. ed. 2. 435. 1853.
A rather slender and smooth perennial 60 to 120 cm. high, with erect, simple culms, long, flat leaves 4 to 12 mm. wide, and open nodding panicles 10 to 20 cm. long; spikelets about 3 mm. long, with nearly equal, acute glumes and short-awned or nearly awnless lemma raised on a short stipe.

Thickets and moist woodlands, Kodiak Island and Cook Inlet to southeastern Alaska, eastward to Newfoundland, and southward to North Carolina and Colorado; also in northern Europe and Asia.

SPECIMENS EXAMINED: Revillagigedo Island, *Howell* 1712a; Seldovia, *Trelease & Saunders* 2097; Juneau, *Coville & Kearney* 2477, *Cole* in 1899; Yakutat, *Piper* 4702, 2714; Homer, *Piper* 4713; Kodiak, *Piper* 4712.

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[a] Gram. Icon. **1:** *pl. 55.* 1828.

## 8. AGROSTIS L.

*Agrostis* L. Sp. Pl. 61. 1753.

Spikelets 1-flowered; rachilla articulated above the glumes, not produced beyond the floret; glumes 2, subequal, usually exceeding the floret; lemma less firm in texture than the glumes, awnless, or with a slender dorsal awn; palea hyaline, shorter than the lemma, or wanting. Mostly perennial grasses with small spikelets in open, usually diffuse panicles.

Palea conspicuous, about one-half the length of the lemma ..... 1. *A. alba.*
Palea minute or wanting.
  Panicle diffuse, the branches capillary, scabrous ..... 2. *A. hyemalis.*
  Panicle usually contracted, or if spreading the branches glabrous.
    Spikelets awnless ..... 3. *A. exarata.*
    Spikelets awned.
      Awn straight, included ..... 4. *A. melaleuca.*
      Awn geniculate, exserted ..... 5. *A. borealis.*

1. **Agrostis alba** L. Sp. Pl. 63. 1753. REDTOP.

An erect, glabrous perennial 30 to 80 cm. high, sometimes decumbent and stoloniferous at the base, with numerous plane scabrous leaves and contracted or open green or purplish panicles 5 to 15 cm. long, the branches ascending or erect; ligule 6 mm. long or less; spikelets 2 to 2.5 mm. long, the glumes subequal, acute, scabrous on the keel; lemmas obtuse or acute, awnless.

Kodiak Island and Cook Inlet. Extensively introduced throughout North America and perhaps native northward.

SPECIMENS EXAMINED: Kodiak, *Georgeson* 1 in 1898, an old specimen doubtfully referred to this species; Homer, *Piper* 4619.

2. **Agrostis hyemalis** (Walt.) B. S. P. Prel. Cat. N. Y. 68. 1888.

*Cornucopiae hyemalis* Walt. Fl. Carol. 73. 1788.

*Agrostis scabra* Willd. Sp. Pl. **1:** 370. 1798.

A slender, tufted, glabrous perennial 30 to 60 cm. high, with ample, spreading, capillary, usually purplish panicles, often 40 cm. long, with strongly scabrous branches and numerous small awnless spikelets; spikelets 1.5 to 2 mm. long; glumes subequal, acute, scabrous on the keels.

The Shumagin Islands, Prince William Sound, and the valley of the Yukon to Newfoundland and southward.

SPECIMENS EXAMINED: Apollo, *Piper* 4632, 4636; Yukon River, *Funston* 148; Kenai, *Piper* 4633, 4635; Nagai Island, *Harrington* in 1871; Homer, *Evans* 497, *Piper* 4634; Valdez, *Piper* 4631.

An exceedingly variable species which presents many interesting forms, of which the extremes in habit and vegetative characters are very distinct from each other, but on account of the many intergrading forms can not be readily separated.

2a. **Agrostis hyemalis nutkaensis** (Kunth).

*Trichodium album* Presl, Rel. Haenk. **1:** 244. 1830.[a]

*Agrostis nutkaensis* Kunth, Enum. Pl. **1:** 222. 1833.

Slender, 15 to 40 cm. high, with comparatively small, pale or rarely purplish panicles 4 to 10 cm. long; spikelets as in the species.

Aleutian Islands to southeastern Alaska and southward.

SPECIMENS EXAMINED: Unalaska, *Piper* 4225; Shumagin Islands, Popof, *Trelease & Saunders*, 2902, 2904, 2905, *Saunders & Kincaid* in 1899; Yes Bay, Behm Canal, *Howell* 1711; Kodiak, *Trelease & Saunders* 2901, *Piper* 4624.

A subspecies distinguished from the species only by its smaller size and smaller, more or less contracted, and usually pale panicles.

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[a] See also Scribn. Rep. Mo. Bot. Gard. **10:** 54. *pl. 34.* 1899.

2b. **Agrostis hyemalis geminata** (Trin.) Hitchc. U. S. Dept. Agr. Bur. Pl. Ind. Bull. **68:** 44. 1905.

*Agrostis geminata* Trin. Gram. Unifl. 207. 1824.

A low subspecies, 20 to 40 cm. high, with ample, diffuse panicles and awned spikelets; awn slender, straight, about equaling the lemma.

Aleutian Islands and Kodiak Island.

SPECIMENS EXAMINED: Kodiak, *Piper* 4622; Unalaska, *Eschscholtz;* Yakutat, *Piper* 4630 in part; Ratz Harbor, Prince of Wales Island, *Flett* 2014; Juneau, *Cole,* in 1899, *Coville & Kearney* 2461, 2509, *Brewer & Coe* 574, *Trelease & Saunders* 2900; Sitka, *Piper* 4623.

The specimen collected by Brewer & Coe, no. 574, exactly matches the duplicate type and Trinius's plate and description of the species; the other specimens cited are larger and more robust, but are evidently the same.

3. **Agrostis exarata** Trin. Gram. Unifl. 207. 1824.

A rather stout, erect, nearly glabrous perennial, 30 to 80 cm. high, with flat, linear-lanceolate, somewhat scabrous leaves 3 to 8 mm. wide, and elongated, narrow, many-flowered, green or pale panicles 10 to 25 cm. long, 1 to 3 cm. in diameter, the branches fasciculate, flower-bearing throughout, appressed or ascending, the lower ones sometimes 8 cm. long; spikelets 3 to 4.5 mm. long; glumes lanceolate, acuminate, scabrous, much exceeding the glabrous lemma, the latter about 2 mm. long; palea very small or wanting.

In wet soils, the Aleutian Islands to southeastern Alaska, thence to Wisconsin, Texas, and California.

SPECIMENS EXAMINED: Apollo, *Piper* 4645, 4638, 4643; Atka Island, *Macoun* 31, *Turner* 1210; Unalaska, *Evans* 518, *Applegate, Harrington* in 1871–72, *Piper* 4639, 4644. Juneau, *Cole* in 1899, *Coville & Kearney* 2473; Sitka, *Mertens* (from Herb. Acad. St. Petersb.), *Piper* 4640; Yakutat, *Piper* 4641, 4642; Yes Bay, *Howell* 1710; without locality, *Funston* 118.

4. **Agrostis melaleuca** (Trin.) Hitchc. U. S. Dept. Agr. Bur. Pl. Ind. Bull. **68:** 51. 1905.

*Agrostis canina melaleuca* Trin. in Bong. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **2:** 170. 1832.

A slender, erect, glabrous species 40 to 50 cm. high, with linear soft leaves and slightly spreading, purplish, nodding panicles 5 to 7 cm. long; spikelets about 3 mm. long, glumes subequal; lemma acute, glabrous, awnless or usually with a short, straight dorsal awn arising from about the middle.

Unalaska to Cook Inlet and southeastern Alaska.

SPECIMENS EXAMINED: Ankow River, *Piper* 4626; Kodiak Island, *Georgeson* 2, 3, *Evans* 454; Sitka, *Piper* 4629, *Wright* in 1891; Seldovia, *Piper* 4627; Unalaska, *Mertens* (from Herb. Acad. St. Petersb.), *Kellogg* 119; Yakutat, *Piper* 4628, 4830 in part; Attu Island, *Macoun* 32126.

5. **Agrostis borealis** Hartm. Skand. Fl. ed. 3. 17. 1838.

*Agrostis rubra* Am. auct.

A cespitose species 15 to 40 cm. high with narrow, flat leaves, open panicles 5 to 10 cm. long, and awned spikelets 2.5 to 3 mm. long; glumes subequal, glabrous except on the keel above; lemma a little shorter than the glumes, ovate-oblong, truncate, awned on the back, the awn geniculate, at least when dry, exceeding the glumes in length.

Seward Peninsula to Kodiak Island and southeastern Alaska, eastward to Newfoundland and southward to the mountains of New England and North Carolina; also in Europe and Asia.

SPECIMENS EXAMINED: Nome City, *Flett* 1689; Unalaska, *Mertens, Piper* 4618; Kodiak, *Coville & Kearney* 2348, *Piper* in 1904; Sitka, *Wright* 1584.

## 9. PODAGROSTIS (Griseb.).

*Agrostis* section *Podagrostis* Griseb. in Ledeb. Fl. Ross. **4:** 436. 1853.

Spikelets 1-flowered, rachilla prolonged behind the palea into a minutely pubescent rudiment which is a little less than half the length of the palea; callus naked; glumes 2, equal, as long as the floret; lemma usually with a minute awn which is attached near the apex; palea nearly equaling the lemma, less firm in texture and nearly hyaline.

A genus intermediate between Agrostis and Calamagrostis, differing from the former in having the glumes and lemma equal and the rachilla prolonged; from the latter in its minute terminal awn, equal glumes and lemma, and the absence of callus hairs.

1. **Podagrostis aequivalvis** (Trin.)

*Agrostis canina aequivalvis* Trin. in Bong. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **2:** 171. 1832.

A slender, erect, glabrous perennial 15 to 50 cm. high, with linear, plane leaves and exserted open, few-flowered, purplish panicles 5 to 10 cm. long; spikelets 3 to 3.5 mm. long, glabrous, ovate, acute; glumes equal; lemma equaling the glumes, acute, glabrous, sometimes with a very short awn near the apex; callus with a few short hairs; prolongation of the rachilla pilose, about two-thirds as long as the lemma.

In marshes and swamps, Unalaska to Yakutat Bay and southeastern Alaska, thence southward to the mountains of Oregon.

Alaska specimens: Sitka, *Mertens* (specimen from the type collection from Herb. Acad. St. Petersb.), *Wright* 1579, *Piper* 4620; Helm Bay, Cleveland Peninsula, *Flett* 2015; Yes Bay, *Howell* 1712, *Gorman* 92; Latouche, *Piper* 4621.

A species readily recognized by its slender habit, by its lemma equaling the glabrous glumes, and by the pilose prolongation of the rachilla, in which character it approaches the genus Calamagrostis.

A specimen from Unalaska with the lemma one-third shorter than the glumes, was called *Agrostis aequivalvis obliqua* by Grisebach,[a] but we have seen no specimens representing this variety.

## 10. CALAMAGROSTIS Adans.

*Calamagrostis* Adans. Fam. Pl. **2:** 31. 1763.

Spikelets 1-flowered; rachilla produced above the floret into a short, usually hairy pedicel or bristle; glumes subequal, awnless and usually exceeding the lemma, this surrounded at the base with copious hairs and awned on the back, usually from below the middle. Tall, often reed-like, perennial grasses with small spikelets in many-flowered terminal panicles.

Awn strongly geniculate, exserted; callus hairs shorter than the lemma.
- Low grasses, not exceeding 30 cm. in height; leaves glabrous.
  - Panicle densely flowered, 2 to 3 cm. long..... 2. *C. arctica.*
  - Panicle open, pyramidal, 4 to 9 cm. long..... 1. *C. deschampsioides.*
- Tall stout grasses 30 to 140 cm. high; leaves scabrous.
  - Plant 60 cm. high or less; leaf blades involute or plane, 5 mm. wide or less; awn long-exserted..... 3. *C. purpurascens.*
  - Plant robust, exceeding 60 cm. in height, leaf blades 6 to 12 mm. wide; awn but slightly exserted..... 4. *C. aleutica.*

Awn straight or nearly so, not exserted; callus hairs mostly equaling the lemma.

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[a] Ledeb. Fl. Ross. **4:** 436. 1853.

Panicles open, spreading; leaf blades flat.
Spikelets 4 to 6 mm. long; glumes strongly scabrous.. 5. *C. langsdorffii.*
Spikelets 3 to 3.5 mm. long; glumes only slightly scabrous..... 6. *C. canadensis.*
Panicles narrow, contracted, often almost spike-like; leaf blades narrow, mostly involute.
Spikelets 3.5 mm. long or less; whole plant soft in texture..... 8. *C. neglecta.*
Spikelets 4 to 5 mm. long; plants mostly rigid.
Spikelets 5 mm. long; glumes minutely scabrous-pubescent..... 7. *C. lapponica.*
Spikelets 4 to 4.5 mm. long; glumes glabrous except on the scabrous keels..... 9. *C. hyperborea.*

1. **Calamagrostis deschampsioides** Trin. Gram. Icon. **3:** *pl. 354.* 1836.

A slender, cespitose perennial, 15 to 30 cm. high, from creeping rootstocks, with narrow leaves 3 to 7 cm. long and open pyramidal panicles 4 to 8 cm. long; spikelets 4 mm. long, or in the subspecies 6 to 7 mm. long; glumes acute, about the length of the awned lemma; awn stout, exceeding the lemma.

Pribilof Islands to Cook Inlet and Prince William Sound; also in Kamchatka.

SPECIMENS EXAMINED: St. Paul, *Merriam* in 1891, *Macoun* 16224; Prince William Sound, near Orca, *Coville & Kearney* 1336a; Kasilof, *Evans* 683, 742.

1a. **Calamagrostis deschampsioides macrantha** Piper, subsp. nov.

Spikelets 6 to 7 mm. long, otherwise as in the species.

Type U. S. National Herbarium no. 592345 collected July 25, 1904, Kodiak, Alaska, by C. V. Piper (no. 4688).

2. **Calamagrostis arctica** Vasey, U. S. Dept. Agr. Div. Bot. Bull. **13:** *pl. 55.* 1892.

A glabrous perennial, 20 cm. high or less, with short flat leaves and small purplish panicles 2 to 3 cm. long, barely 1 cm. in diameter; spikelets 4 to 5 mm. long; glumes lanceolate, scabrous on the keels and minutely scabrid throughout; lemma 4 mm. long, smooth; awn attached near the base, 6 to 7 mm. long, exserted; callus hairs about one-fourth as long as the lemma.

Pribilof and Shumagin Islands.

SPECIMENS EXAMINED: St. Paul Island, *Macoun* 38; Shumagin Islands, Popof, *Kincaid* in 1899.

This species is recognized by its small size, small panicles, spikelets smaller than in *Calamagrostis purpurascens*, and by its perfectly glabrous leaves and sheaths.

3. **Calamagrostis purpurascens** R. Br. in Richards. Bot. App. Frankl. Journ. 731. 1823.

*Calamagrostis sylvatica* A. Gray, Proc. Amer. Acad. **6:** 80. 1868.

*Calamagrostis yukonensis* Nash, Bull. N. Y. Bot. Gard. **2:** 154. 1901.

A rather rigid, densely cespitose, erect perennial 30 to 60 cm. high, with firm flat or involute leaves scabrous beneath, densely short-pubescent above, and densely flowered, purple, spike-like panicles 5 to 15 cm. long; spikelets 5 to 6 mm. long; glumes hispidulous; lemma hispidulous, 4 to 5 mm. long, the geniculate awn attached near the base, 5 to 8 mm. long, exserted, twisted below the geniculation.

In dry rocky soils, arctic Alaska and the upper Yukon, eastward to Greenland and southward in the mountains to Colorado and California.

SPECIMENS EXAMINED: Port Clarence, *Walpole* 1629; Yukon River, *Funston* in 1893; Five Finger Rapids, *Funston*, *Tarleton* 84; Fort Yukon, *McDonald* in 1864; Eagle, *Georgeson* 31; Chandlar (Gens de Large) and Koyukuk Rivers, *Schrader* in 1899; Dawson, *Williams* in 1899; without locality, *McGrath* in 1890.

*Calamagrostis yukonensis* Nash is stated by the author to be related to *Calamagrostis tweedyi*, but a most minute examination and comparison fails to reveal any points on which *C. yukonensis* can be separated from *C. purpurascens*. The narrow leaves of the plant described as *Calamagrostis yukonensis* do not form a valid distinguishing character, since in the specimens collected by McGrath, cited above, both narrow and relatively broad leaves are found in the same innovation. In no other respect have we been able to find any differential characters between *Calamagrostis yukonensis* and *C. purpurascens*.

4. **Calamagrostis aleutica** Trin. in Bong. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **2:** 171. 1832.

A stout, erect perennial, 60 to 150 cm. high, with long, rather stiff, flat leaves and densely many-flowered, narrow panicles 15 to 30 cm. long; spikelets 5 to 6 mm. long; glumes acuminate, somewhat exceeding the lemma; awn barely equaling the lemma; callus hairs few and short.

In rocky or marshy places in the Aleutian Islands to southeastern Alaska, and along the coast to California.

SPECIMENS EXAMINED: Unalaska, *Mertens* (from Herb. Acad. St. Petersb.), *Kellogg* 111, *Applegate*, *Evans* 515, *Harrington* in 1871–72; Sitka, *Mertens* (from Herb. Acad. St. Petersb.), *Evans* 790; Wrangell, *Evans* 149; Yes Bay, Behm Canal, *Howell* 1713.

5. **Calamagrostis langsdorffii** Trin. Gram. Unifl. 225. *pl. 4. f. 10.* 1824.

A stout, erect perennial 60 to 120 cm. high, with long, flat leaves and open, pyramidal panicles 4 to 12 cm. long; spikelets 4 to 6 mm. long; glumes lanceolate, strongly scabrous or strigose; callus hairs copious, soft, the longer ones exceeding the lemma.

In moist meadows throughout Alaska, eastward to Greenland and southward in the mountains to North Carolina and New Mexico; also in northern Europe and Asia.

6. **Calamagrostis canadensis** (Michx.) Beauv. Ess. Agrost. 157. 1812. BLUEJOINT.

*Arundo canadensis* Michx. Fl. Bor. Amer. **1:** 73. 1903.

An erect, glabrous, or scabrous perennial, 50 to 180 cm. high, with numerous leafy innovations and oblong-ovate, open or somewhat contracted panicles 10 to 20 cm. in length; spikelets 3 to 3.5 mm. long; glumes lanceolate, acute, scabrous; lemma about 2.5 mm. long, bearing a slender, straight awn 1 to 2 mm. in length.

Wet meadows and margins of lakes and streams on the upper Yukon, eastward to Labrador, and southward to North Carolina and New Mexico.

SPECIMENS EXAMINED: Dawson, *Williams* in 1899; Yukon River, *Funston* 159; Fort Yukon, *Georgeson* 27; Eagle, *Georgeson* 32; White River, *Gorman* 1149.

6a. **Calamagrostis canadensis acuminata** Vasey; Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **5:** 26. 1897.

A doubtful subspecies with rather small, more flexuous, and more densely flowered panicles, narrowly acuminate glumes, and somewhat larger spikelets (3.5 to 4 mm. long), approaching *C. langsdorffii*.

Range of the species.

SPECIMENS EXAMINED: Alatna River, *Schrader* in 1899; Circle City, *Osgood* in 1899; Kodiak Island, Sturgeon River, *Coville & Kearney* 2252; Kukak Bay, Alaska Peninsula, *Coville & Kearney* 1195.

This subspecies represents a transition from *Calamagrostis canadensis* to *C. langsdorffii*, the extreme form being separated from the latter only by its slightly shorter spikelets, shorter awn, and less scabrous glumes.

CALAMAGROSTIS ALASKANA Kearney, U. S. Dept. Agr. Div. Agrost. Bull. **11:** 32. 1898, can only be distinguished from *C. canadensis* by its more contracted panicles and shorter panicle branches. It is represented by the following specimens: Yukon River, *Funston* 157; Bennett City, *Williams* in 1899; Port Clarence, *Brewer & Coe* 395.

CALAMAGROSTIS ATROPURPUREA Nash, Bull. N. Y. Bot. Gard. **2:** 153. 1901, is a form intermediate between *Calamagrostis canadensis* and *C. langsdorffii*, differing from the former in its shorter panicles and more scabrous glumes, and from the latter in its smaller spikelets and less acute glumes. The following specimens are referred here: Dawson, *Williams* in 1899; and (doubtfully) 16 miles west of Nome City, *Flett* 1684. *C. perplexa* Scribn.[a] belongs here.

7. **Calamagrostis lapponica** (Wahl.) Hartm. Skand. Fl. **1:** 46. 1820.

*Arundo lapponica* Wahl. Fl. Lapp. 27. 1812.

A slender, glabrous perennial 30 to 100 cm. high, with narrow, often involute leaves and dull brownish purple and contracted panicles 7 to 15 cm. long, interrupted below; spikelets about 5 mm. long; glumes acute, minutely scabrous-pubescent; lemma 4 to 4.5 mm. long; awn rather stout, about equaling the lemma, slightly geniculate and twisted.

In damp soils, valley of the Koyukuk; also in northern Europe and Asia.

SPECIMENS EXAMINED: Dall River, *O. A. Piper* in 1904.

Reported from Dawson [b] (*Williams* in 1899), with the statement that the Alaskan specimen exactly matches a specimen in the herbarium of Columbia University named *Arundo lapponica* by Wahlenberg. It is also reported from Unalaska by Grisebach.[c]

8. **Calamagrostis neglecta** (Ehrh.) Gaertn. in Gaertn. Mey. & Scherb. Fl. Wett. **1:** 94. 1799.

*Arundo neglecta* Ehrh. Beitr. Naturk. **6:** 84. 137. 1791.

A slender, glabrous perennial 25 to 100 cm. high, of soft texture, with often numerous innovations, strongly involute, often nearly filiform leaf blades and narrow, contracted panicles 6 to 10 cm. long, of small spikelets; spikelets 2.5 to 3.5 mm. long; glumes not strongly keeled, glabrous except on the scabrous keels, thin-membranous; lemma 2.5 mm. long; awn about equaling the lemma, straight or slightly bent.

In damp soils, valley of the Koyukuk, the Porcupine River, and the upper Yukon, eastward to Labrador and southward to Maine, Colorado, and Oregon; also in northern Europe and Asia.

SPECIMENS EXAMINED: Dall River, *O. A. Piper* in 1904; Fort Yukon, *Bates* in 1889; Porcupine River, *Turner* in 1891.

9. **Calamagrostis hyperborea** Lange, Fl. Dan. **50:** *pl. 3.* 1880; Consp. Fl. Groenland. 160. 1880.

A rigid, erect perennial 40 to 70 cm. high, with flat or involute leaves and densely flowered, almost spike-like panicles 5 to 10 cm. long, usually somewhat interrupted below; spikelets about 4 mm. long, the glumes firm, scabrous, usually tinged with purple; lemma about 3.5 mm. long, punctate-scabrous, bearing a stout, nearly straight awn on the back which about equals it in length.

In damp soils, the Aleutian Islands to the upper Yukon, eastward to Greenland and southward in the mountains to Vermont, Arizona, and California.

SPECIMENS EXAMINED: Yukon River, *Dawson* 97; Shumagin Islands, *Trelease & Saunders* 2918, *Saunders* in 1899; Unalaska, *Harrington* in 1871–72.

## 11. DESCHAMPSIA Beauv.

*Deschampsia* Beauv. Ess. Agrost. 91. *pl. 8. f. 3.* 1812.

Spikelets 2 or rarely 3-flowered; rachilla hairy, articulated above the glumes and prolonged beyond the upper floret as a hairy bristle; glumes 2, subequal; lemmas subhyaline, 4-nerved, bearing on the back a slender, usually twisted and geniculate awn. Annual or perennial grasses with flat or convolute leaves and rather small shining spikelets in terminal, narrow, or open panicles.

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[a] U. S. Dept. Agr. Div. Agrost. Circ. **30:** 7. 1901.

[b] Nash, Bull. N. Y. Bot. Gard. **2:** 154. 1901.

[c] Ledeb. Fl. Ross. **4:** 429. 1853.

Glumes extending much beyond the lemmas.
  Annual.
    Panicle branches widely spreading ..... 1. *D. calycina.*
    Panicle branches erect, the panicle elongated..... 2. *D. elongata.*
  Perennial; panicle short, branches spreading..... 3. *D. atropurpurea.*
Upper lemma equaling or extending beyond the glumes.
  Spikelets 6 to 7 mm. long..... 4. *D. bottnica.*
  Spikelets 3.5 to 5 mm. long.
    Plants 60 to 100 cm. high..... 5. *D. caespitosa.*
    Plants 40 cm. high or less.
      Culm leaves very short, basal ones filiform, soft; spikelets 3 to 4 mm. long..... 7. *D. curtifolia.*
      Culm leaves elongated, basal ones firm, involute; spikelets about 5 mm. long..... 6. *D. alpina.*

1. **Deschampsia calycina** Presl, Rel. Haenk. 1: 251. 1830.

A rather slender, erect, cespitose species, 10 to 70 cm. high, with very narrow leaves and spreading panicles; spikelets 6 to 8 mm. long with linear-lanceolate, 3-nerved, subequal glumes; lemmas 2 to 3 mm. long, awned just below the middle; awn twisted below, geniculate, 3 to 4 times as long as the lemma.

In damp soils, upper Yukon and Yakutat Bay, thence southward to Utah, California, Mexico, and Peru.

SPECIMENS EXAMINED: Yakutat Bay, *Piper* 4650; Dawson, *Williams* in 1899, probably introduced.

2. **Deschampsia elongata** (Hook.) Munro in Benth. Pl. Hartw. 342. 1857.

*Aira elongata* Hook. Fl. Bor. Amer. **2**: 243. *pl. 288*. 1840.

A slender species 30 to 120 cm. high, with flat or involute, glabrous leaves and narrow elongated panicles; spikelets about 4 mm. long with nearly equal, very acute, 3-nerved glumes which exceed the florets in length; lemmas about 2 mm. long, bearing a slender awn near the base, which is at least twice as long as the lemma.

Introduced in Alaska at Yakutat Bay and in southeastern Alaska, and extending southward to Montana and Mexico.

ALASKA SPECIMENS: Yakutat, *Piper* 4737; reported from Chilkat, by F. Kurtz.[a]

3. **Deschampsia atropurpurea** (Wahl.) Scheele, Flora **27**: 56. 1844.

*Aira atropurpurea* Wahl. Fl. Lapp. 37. 1812. MOUNTAIN HAIRGRASS.

A slender, alpine grass 15 to 40 cm. high, with flat leaves and few-flowered, nodding panicles 3 to 12 cm. long; spikelets about 5 mm. long with ovate-lanceolate, acute, glumes and erose-truncate, awned lemmas 2.3 mm. long; awns geniculate, exceeding the lemma.

In moist soil, the Aleutian Islands, Yakutat Bay, and southeastern Alaska eastward to Labrador and south in the mountains to New York and Colorado; also in Europe, Asia, and South America.

SPECIMENS EXAMINED: Juneau, *Cooley* in 1891; Latouche, *Piper* 4724, 4733; Unalaska, *Applegate*, viviparous form, *Kellogg* 98, *Piper* 4722; Atka Island, *Turner* 1189; Sitka, *Evermann* 229, *Piper* 4734, 4735; Iliuliuk, *Harrington* in 1871–72; Yes Bay, Behm Canal, *Gorman* 137.

4. **Deschampsia bottnica** (Wahl.) Trin. Fund. Agrost. 158. 1820.

*Aira bottnica* Wahl. Fl. Lapp. 36. 1812.

A rather stout, glabrous, cespitose perennial 60 to 100 cm. high, with numerous firm, very smooth, usually involute leaves, and elongated, mostly contracted, pale or purplish panicles 15 to 30 cm. long; ligule often 1 cm. in length; spikelets 6 mm. long, lanceolate; lemmas about 4 mm. long, the awn usually exserted.

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[a] Bot. Jahrb. Engler **19**: 421. 1894.

In damp soils, the Pribilof and Aleutian islands to southeastern Alaska and southward to Oregon; also in northern Europe and Asia.

This species is closely related to *Deschampsia caespitosa* and in many cases the two forms can only be separated arbitrarily. In general, however, *Deschampsia bottnica* is distinguished by its narrower panicles, larger spikelets, often longer awn, and thicker, firmer leaves, which are usually involute.

5. **Deschampsia caespitosa** (L.) Beauv. Ess. Agrost. 91. 1812. HAIRGRASS.

*Aira caespitosa* L. Sp. Pl. 64. 1753.

A cespitose, glabrous perennial 60 to 100 cm. high, with usually flat leaves, glabrous beneath, scabrous above, and open panicles 10 to 20 cm. in length; spikelets 3 to 4 mm. long; awn slender, equaling or a little shorter than the lemma.

In damp soils, Shumagin Islands and Bristol Bay to the upper Yukon, eastward to Newfoundland and southward to New Jersey, Minnesota, New Mexico, and California; also in Europe and Asia.

SPECIMENS EXAMINED: Fort Yukon, *Georgeson* 21, *Bates* in 1889; White River, *Gorman* 1150; Dawson, *Williams* in 1899; Shumagin Islands, *Trelease & Saunders* 2928, *Harrington* in 1871–72; Unalaska, *Macoun* in 1891; Nushagak, *McKay* in 1881; without locality, *Bates* in 1889.

6. **Deschampsia alpina** (L.) Roem. & Schult. Syst. Veg. **2:** 686. 1817.

*Aira alpina* L. Sp. Pl. 65. 1753.

A densely cespitose perennial 30 cm. high or less with numerous, flat or folded basal leaves, glabrous beneath, scabrous above, and pyramidal panicles 10 cm. long or less; panicles often rather densely flowered, the lower branches spreading or ascending, fasciculate, 5 to 6 cm. long, flower-bearing above the middle; spikelets about 5 mm. long, very similar to those of *Deschampsia caespitosa*.

In damp soil, islands of Bering Sea and Alaska Peninsula; also in northern North America, Europe, and Asia.

SPECIMENS EXAMINED: Cold Bay, *Piper* 4726; St. Paul Island, *Macoun* 128, *Palmer*, *Trelease & Saunders* 3005, Dall's Expedition, *Elliott* in 1872, *Merriam* in 1891; Seal Islands, *Bryant* in 1875; St. Matthew Island, *Coville & Kearney* 2103.

The species here recognized as *Deschampsia alpina* differs in some respects from the European specimens, but the points of difference are not sufficiently constant and distinct to warrant its recognition as a new species. It intergrades with both *Deschampsia caespitosa* and *D. bottnica*, but is distinguished by its small size, pyramidal panicles and more rigid panicle branches, and by its spikelets which are intermediate in size between those of *Deschampsia caespitosa* and *D. bottnica*.

7. **Deschampsia curtifolia** Scribn. U. S. Dept. Agr. Div. Agrost. Circ. **30:** 7. 1901.

*Deschampsia brachyphylla* Nash in Rydb. Mem. N. Y. Bot. Gard. **1:** 37. 1900, not Philippi, Anal. Univ. Chile **94:** 23. 1896.

A densely cespitose perennial 40 cm. high or less, with numerous very narrow involute basal leaves, short culm leaves, and exserted, contracted or spreading panicles 3 to 7 cm. long; spikelets 3 to 4 mm. long, similar to those of *Deschampsia caespitosa*.

Islands of Bering Sea to the Shumagin Islands and Alaska Peninsula, and southward in the mountains to Montana and Wyoming.

SPECIMENS EXAMINED: Cold Bay, *Piper* 4723, 4730; Shumagin Islands, *Kincaid* in 1899, *Trelease & Saunders* 2927, 2968, *Piper* 4732, 4731, 4728; Hall Island, *Macoun* in 1891; Kodiak, *Piper* 4727.

*Deschampsia brevifolia* R. Br. has been credited to Alaska by various authors and its range has been extended, erroneously, we believe, south to the mountains of Montana and Wyoming.[a] It appears that this species was misinterpreted by Trinius [b]

[a] Rydberg, Mem. N. Y. Bot. Gard. **1:** 37. 1900.

[b] Gram. Icon. **3:** *pl. 256A*. 1836.

and has been also by recent authors. *Deschampsia brachyphylla* Nash is distinct from the plant described as *Deschampsia brevifolia* by Robert Brown, which belongs to *Deschampsia arctica* (Spreng.) Merrill.

## 12. TRISETUM Pers.

*Trisetum* Pers. Syn. Pl. 1: 97. 1805.

Spikelets 2-flowered or rarely 3 to 5-flowered; rachilla hairy or naked, articulated above the glumes and between the florets, produced beyond the upper floret as a (usually) hairy bristle; glumes 2, awnless, carinate, usually unequal; lemmas subhyaline, carinate, cleft or 2-toothed at the apex, the teeth sometimes produced into slender awns, bearing between them, or a little below the cleft, a straight or usually twisted and geniculate awn. Cespitose perennials with flat leaves and dense spike-like or loose and open panicles.

Inflorescence a lax, open, few-flowered panicle..... 1. *T. cernuum.*
Inflorescence a densely flowered spike-like panicle.
  Plants glabrous or nearly so..... 2. *T. spicatum.*
  Plants densely soft-pubescent throughout.
    Spikelets about 5 mm. long..... 2a. *T. spicatum molle.*
    Spikelets about 7 mm. long..... 3. *T. alaskanum.*

1. **Trisetum cernuum** Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **1:** 61. 1830.

A slender perennial 60 to 100 cm. high with rather broad, flat leaves and loosely flowered, nodding panicles 12 to 20 cm. long; spikelets 6 to 8 mm. long, 2 to 4-flowered; lemmas with a few hairs at the base, scabrous, cleft at the apex and bearing a slender awn 6 to 10 mm. long.

In damp soil and thickets, from Yakutat Bay to the southeastern boundary and southward to Montana, Idaho, and northern California.

ALASKA SPECIMENS: Yakutat, *Piper* 4650; Latouche, *Piper* 4648; Juneau, *Coville & Kearney* 2512; Yes Bay, Behm Canal, *Howell* 1716; Sitka, *Piper* 4649.

2. **Trisetum spicatum** (L.) Richter, Pl. Eur. **1:** 59. 1890.

*Aira spicata* L. Sp. Pl. 64. 1753, not *A. spicata* L. op. cit. 63.
*Aira subspicata* L. Syst. Nat. ed. 10. 873. 1759.

A tufted, nearly glabrous perennial, 10 to 60 cm. high, with densely flowered, spike-like, usually purplish panicles 3 to 10 cm. long; spikelets 2 or 3-flowered, usually about 5 mm. long, the lemmas slightly exserted, each bearing a scabrous, usually flexuous awn about as long as the lemma.

In rocky places, Seward Peninsula to the Aleutian Islands and southeastern Alaska, eastward to Labrador and southward to North Carolina, New Mexico, and California; also in Europe, Asia, and Australia.

SPECIMENS EXAMINED: Port Clarence, *Walpole* 1790, 1714, 1991; Unalaska, *Harrington* in 1871–72; Kukak Bay, *Trelease & Saunders* 2934; Muir Glacier, *Trelease & Saunders* 2932.

An extremely variable and widely distributed species presenting many puzzling forms.

2a. **Trisetum spicatum molle** (Michx.)

*Avena mollis* Michx. Fl. Bor. Amer. **1:** 72. 1803.
*Trisetum molle* Kunth, Rév. Gram. **1:** 101. 1829.

A densely tufted form with habit and spikelet characters of the species, but differing in its densely pubescent culms, sheaths, and leaves.

Throughout Alaska and the same general range as the species.

3. **Trisetum alaskanum** Nash, Bull. N. Y. Bot. Gard. **2:** 155. 1901.

A tufted perennial 20 to 50 cm. high, with villous culms, pubescent blades and sheaths, and densely flowered, spike-like, contracted panicles 4 to 10 cm. long; spikelets 6 to 7 mm. long, 2 or 3-flowered; lemmas not exserted, hispidulous, the lower one 5 to 6 mm. long; awn about as long as the lemma.

On open hillsides, Aleutian Islands, Alaska Peninsula, and southeastern Alaska.

A doubtful species closely related to *Trisetum spicatum molle*, from which it is distinguished only by its larger spikelets and included lemmas.

TRISETUM FLAVESCENS (L.) Beauv. is reported from Port Clarence [a] but evidently on an erroneous determination, the plant so named doubtless being *Trisetum cernuum*. *Avena subspicata* of Griseb. in Ledeb. Fl. Ross. is *Trisetum spicatum molle*, while *Avena sesquiflora* of the same work is true *Trisetum spicatum*. The range of *Trisetum canescens* Buckl. is extended to Alaska by Beal [b] sub *T. cernuum canescens*, but he cites no Alaskan material.

## 13. AVENA L.

*Avena* L. Sp. Pl. 79. 1753.

Spikelets 2 to 4-flowered, callus of the lemmas bearded; glumes membranaceous, exceeding the lemmas in length; lemmas rounded on the back, 5 to 9-nerved with a dorsal twisted awn. Native species, perennials with paniculate inflorescence and usually large spikelets.

1. **Avena striata** Michx. Fl. Bor. Amer. **1:** 73. 1803.

A slender, erect, glabrous perennial 30 to 60 cm. high, with narrow, flat leaves, short ligules, and simple, racemose, open panicles; spikelets about 12 mm. long, 3 to 6-flowered, on slender pedicels; glumes acute, the first 1-nerved, the second 3-nerved; lemmas 7-nerved, about 8 mm. long, much exceeding the palea, bearing a twisted geniculate awn just below the acutely 2-cleft apex.

Collected at Cook Inlet and extending eastward to New England and New York.

SPECIMEN EXAMINED: Kenai, *Piper* 4715.

## 14. BECKMANNIA Host.

*Beckmannia* Host, Icon. Gram. Austr. **3:** 5. *pl. 6.* 1805.

Spikelets 1 or 2-flowered, rather broad, compressed, closely imbricated in two rows along one side of the rachis of the short spikes; rachilla articulated below the glumes; glumes 2, inflated, boat-shaped. A rather tall, erect grass with flat leaves and a terminal, narrow, elongated inflorescence.

1. **Beckmannia erucaeformis** (L.) Host, Icon. Gram. Austr. **3:** 5. *pl. 6.* 1805.

SLOUGH-GRASS.

*Phalaris erucaeformis* L. Sp. Pl. 55. 1753.

In sloughs and along the banks of streams, Porcupine River and the upper Yukon, southward to Ontario, Iowa, and California; also in Europe and Asia.

SPECIMENS EXAMINED: Fort Yukon, *Bates* in 1889; Porcupine River, *Turner* in 1891.

## 15. CATABROSA Beauv.

*Catabrosa* Beauv. Ess. Agrost. 97. 1812.

Spikelets small, usually 2-flowered, the rachilla articulated between the florets; glumes 2, much shorter than the lemmas, unequal, scarious, very obtuse, or the upper one crenulate at the apex; lemmas subcoriaceous, prominently 3-nerved, awnless. A creeping aquatic grass with thin flat leaves and open, pyramidal panicles.

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[a] Kjellman in Nordenskiold, Vega-Exped. **2:** 55. 1883.

[b] Grasses N. Amer. **2:** 380. 1896.

1. **Catabrosa aquatica** (L.) Beauv. Ess. Agrost. 97. 1812.

*Aira aquatica* L. Sp. Pl. 64. 1753.

A glabrous, soft perennial, with creeping or ascending culms 20 to 60 cm. long, with open panicles, the spreading or ascending branches in whorls; spikelets 2.5 to 3.5 mm. long.

About springs and the margins of streams, often in shallow water, Alaska (?) to Newfoundland, south to Utah, Colorado, and Nebraska; also in Europe and Asia.

We have seen no specimen of this grass from Alaska. It is, however, credited to Sitka, by Grisebach.[a]

## 16. MELICA L.

*Melica* L. Sp. Pl. 66. 1753.

Spikelets 2 to several-flowered; rachilla articulated above the glumes and between the fertile florets, usually bearing several empty club-shaped or cucullate glumes at the apex; lemmas exceeding the glumes, awnless or short-awned. Perennial grasses with soft flat leaves, rather large spikelets in lax or dense, usually narrow panicles.

1. **Melica subulata** (Griseb.) Scribn. Proc. Acad. Phila. **1885:** 47. 1885.

*Bromus subulatus* Griseb. in Ledeb. Fl. Ross. **4:** 358. 1853.

*Festuca cepacea* Phil. Linnaea **33:** 297. 1864–65.

*Melica acuminata* Boland. Proc. Calif. Acad. **4:** 104. 1870.

*Melica cepacea* Scribn. U. S. Dept. Agr. Div. Agrost. Circ. **30:** 8. 1901.

An erect, leafy perennial 90 to 120 cm. high, from a bulbous base, with flat leaves and rather lax panicles 10 to 20 cm. long; spikelets 3 to 5-flowered, with unequal glumes and attenuate-pointed lemmas about 12 mm. long, ciliate on the margins and sparingly pilose on the back below.

In forests and along mountain streams, Unalaska, the type locality, to southeastern Alaska, and southward to Montana and California; also in Chile.

SPECIMENS EXAMINED: Howkan, *Evans* 128; Unalaska, *Piper* 4716.

There has been some confusion regarding this species, owing to the fact that *Festuca subulata* Bong. and *Bromus subulatus* Griseb. were both based on Alaskan material, the two species being considered identical by Gray and Thurber, although they are not at all related to each other. The very full description by Grisebach leaves no doubt as to the identity of his species, and it is an interesting fact that the type of *Festuca cepacea* Phil., from the mountains of Chile, now in the herbarium of the University of Chile, exactly matches the common form of *Melica subulata* from our western coast region.

## 17. DACTYLIS L.

*Dactylis* L. Sp. Pl. 71. 1753.

Spikelets 3 to 5-flowered, nearly sessile, in dense fascicles; rachilla articulated above the glumes and between the florets; glumes unequal, 1 to 3-nerved; lemmas 5-nerved, short awn-pointed with a prominent ciliate-fringed keel. Perennial grasses with flat leaves and narrow glomerate panicles.

1. **Dactylis glomerata** L. Sp. Pl. 71. 1753. ORCHARD GRASS.

A coarse, erect grass, 90 to 120 cm. high, forming dense tufts, with long, flat or slightly keeled leaf blades and 3 to 5-flowered spikelets, crowded in dense one-sided clusters at the ends of the panicle branches; lemmas short-awned, ciliate on the keels.

Southeastern Alaska, and extensively naturalized in fields and waste ground throughout the United States; also in Europe and Asia.

SPECIMENS EXAMINED: Howkan, *Evans* in 1897, "growing in a yard, probably seeded from packing."

## 18. POA L.

*Poa* L. Sp. Pl. 67. 1753.

Spikelets 2 to 6-flowered; rachilla articulated above the glumes; glumes lanceolate or ovate, 1 to 3-nerved, keeled; lemmas lanceolate or ovate, awnless, 5-nerved, carinate,

[a] Ledeb. Fl. Ross. **4:** 388. 1853.

the dorsal and marginal nerves usually soft-hairy and often with a tuft of long, cobwebby hairs at the base, rarely glabrous. Annual or perennial grasses with usually open panicles.

Annuals..... 1. *P. annua.*

Perennials.

Culms slender, rarely exceeding 30 cm. in height.

Leaves short, 2 to 4 mm. wide, abruptly acute.

Leaves firm, rigid; panicle branches short, spreading, densely flowered..... 2. *P. alpina.*

Leaves thin, soft; panicle branches elongated, slender, ascending, few-flowered..... 4. *P. glacialis.*

Leaves usually elongated, 2 mm. wide or less, gradually narrowed to the apex.

Lemmas pubescent on the back below..... 3. *P. arctica.*

Lemmas glabrous between the nerves.

Basal leaves thin, soft, elongated, the panicle branches spreading..... 5. *P. paucispicula.*

Basal leaves rather firm, short, often somewhat involute, the panicle branches ascending... 6. *P. laxa.*

Culms usually much exceeding 30 cm. in height, mostly stout.

Spikelets exceeding 6 mm. in length.

Leaf blades narrow, 3 mm. wide or less.

Panicles elongated, narrow, often nodding, the branches ascending..... 13. *P. stenantha.*

Panicles ovate, open, erect, the branches spreading..... 14. *P. acutiglumis.*

Leaf blades 4 to 10 mm. wide.

Panicles ovate, densely flowered, 2 to 4 cm. in diameter, the branches short, ascending, flower-bearing throughout..... 17. *P. trinii.*

Panicles open, the branches naked below, spreading or ascending.

Panicle branches straight, rigid..... 18. *P. eminens.*

Panicle branches flexuous.

Panicles erect..... 16. *P. lanata.*

Panicles nodding, leaf blades rather soft; lemmas 7 mm. long..... 15. *P. turneri.*

Spikelets 6 mm. or less in length.

Lemmas 4 to 6 mm. long; panicles contracted; lemmas not webbed at the base..... 13. *P. stenantha.*

Lemmas less than 4 mm. long.

Pedicels commonly shorter than the spikelets.

Lemmas obscurely nerved..... 7. *P. triflora.*

Lemmas prominently nerved.

Lateral nerves silky-villous..... 10. *P. pratensis.*

Lateral nerves glabrous..... 9. *P. trivialis.*

Pedicels equaling or much exceeding the spikelets.

Spikelets 5 to 6 mm. long; panicle branches glabrous..... 12. *P. leptocoma.*

Spikelets less than 5 mm. in length; panicle branches scabrous.

Leaf blades thin, soft, flaccid; lemmas 3 mm. long..... 11. *P. rotundata.*

Leaf blades firm; lemmas 2.5 mm. long. 8. *P. nemoralis.*

1. **Poa annua** L. Sp. Pl. 68. 1753. ANNUAL BLUEGRASS.

A low tufted, pale green annual with erect or ascending, somewhat flattened culms, 5 to 30 cm. high, flat, thin, spreading leaves, and usually open, short-pyramidal panicles 2 to 5 cm. long; spikelets 3 to 6-flowered, about 4 mm. long; glumes slightly unequal, the second 3-nerved; lemmas obtuse, hairy on the nerves below and pilose at the base, about 2 mm. long, distinctly 5-nerved.

Fields and waste places, Aleutian Islands to southeastern Alaska, eastward to Labrador and southward; also in Europe and Asia.

2. **Poa alpina** L. Sp. Pl. 67. 1753. MOUNTAIN BLUEGRASS.

A densely cespitose, glabrous, erect perennial, 5 to 30 cm. high, with rather broad, flat, firm leaves and spreading, densely flowered, usually purplish, pyramidal panicles 3 to 9 cm. long; spikelets 5 to 6 mm. long, 3 to 6-flowered; glumes broad, aculeolate, scabrous on the keels above, otherwise glabrous; lemmas about 4 mm. long, pilose on the keel and nerves below, pubescent between the nerves near the base.

Along cold mountain streams, open slopes, and canyons, Seward Peninsula to southeastern Alaska, eastward to Labrador, and southward in the mountains to Colorado; also in Europe and Asia.

2a. **Poa alpina vivipara** (Willd.)

*Poa vivipara* Willd. Enum. Pl. 105. 1809.

A form with many of the glumes developed into leaflets. Distinguished from *Poa stenantha vivipara* by its very firm rigid leaves.

SPECIMENS EXAMINED: Hall Island, *Trelease & Saunders* 2964; St. Matthew Island, *Trelease & Saunders* 2963, *Coville & Kearney* 2104; Kukak Bay, *Coville & Kearney* 1500 bis; Popof Island, *Kincaid* in 1899; Yakutat Bay, *Trelease & Saunders* 2966, 2971; Hidden Glacier, Yakutat Bay, *Coville & Kearney* 972; Glacier Bay, *Trelease & Saunders* 2965, *Coville & Kearney* 647; Juneau, *Cooley* in 1891.

3. **Poa arctica** R. Br. Suppl. App. Parry's Voy. 288. 1824.

*Poa williamsii* Nash, Bull. N. Y. Bot. Gard. **2:** 156. 1901.

A slender, cespitose, glabrous, erect perennial 10 to 30 cm. high, with open, few-flowered, purplish panicles and short, narrow leaves, those of the culm 2 to 3 cm. long; panicles 3 to 6 cm. long, the glabrous branches mostly spreading, naked below, bearing 2 or 3 spikelets toward the apex; spikelets ovate, 2 to 4-flowered, about 4 mm. long; glumes subequal, slightly shorter than the lemmas, these silky-pubescent on the keel and nerves below, webbed at the base, pubescent between the nerves toward the base.

Throughout Alaska and eastward to Labrador, south to British Columbia and (?) Colorado; also in Siberia.

This species is widely distributed in the arctic regions and has been confused with *Poa cenisia* All., from which it differs in having the lemmas pubescent between the nerves below; in *P. cenisia* the lemma is pubescent only on the nerves. Our conception of *P. arctica* is based upon a portion of Robert Brown's type from Melville Island (from British Museum), and from the grass described by Nash under the name of *P. williamsii*, which is identical with Brown's specimen.

4. **Poa glacialis** sp. nov.

A densely cespitose, glabrous perennial 20 to 30 cm. high, with rather broad, thin, flat leaves and open panicles of few, large, deep purple spikelets; sheaths overlapping; ligule thin, hyaline, truncate, 2 mm. long; leaf blades glabrous throughout, ascending, pale green, 4 to 6 cm. long, 3 to 4 mm. wide, abruptly acute, those of the innovations usually longer and narrower; panicles 5 to 9 cm. long, the flexuous branches glabrous, naked below, bearing two or three spikelets above, the lower ones about 5 cm. long; spikelets about 7 mm. long, 5-flowered, broadly lanceolate; glumes unequal, broadly lanceolate, acute, the first 3 mm. long, the second 1 mm. longer,




POA PAUCISPICULA SCRIBN. & MERR.

3-nerved; lemmas lanceolate, acute, 5-nerved, 4 to 5 mm. long, with very few hairs on the keel and marginal nerves near the base, not webbed at the base.

A very distinct species, recognized by its low habit, broad, thin, glabrous leaves, open panicles, and large, ovate, deep purple spikelets, and by the absence of webby hairs at the base of the lemma.

Type U. S. National Herbarium no. 376363, collected June 21, 1899, Hubbard Glacier, Alaska, by Coville & Kearney (no. 1077.)

Southeastern Alaska.

SPECIMENS EXAMINED: Disenchantment Bay, Hubbard Glacier, *Coville & Kearney* 1077 (specimens immature); Glacier Bay, *Trelease & Saunders* 2951.

5. **Poa paucispicula** sp. nov. PLATE 15.

A very slender, erect, densely cespitose perennial, 20 to 30 cm. high, from short, creeping rootstocks with numerous thin, narrow, basal leaves and very open panicles 5 to 10 cm. long; sheaths smooth, short, the lower ones marcescent; ligule about 1 mm. long, hyaline, entire, truncate; basal leaves and those of the innovations green, glabrous, 5 to 10 cm. long, about 2 mm. wide, acute and often slightly involute above, those of the culm shorter; panicles somewhat exserted, very lax, few-flowered; rachis glabrous, somewhat undulate; branches in pairs, the lower ones remote and often reflexed, slender, flexuous, glabrous, bearing from 1 to 3 spikelets near the apex, naked below; pedicels equaling or exceeding the spikelets, sparingly scabrous or nearly smooth; spikelets compressed, ovate or oblong, purple, 4 to 6 mm. long, 2 to 5-flowered; first glume 2.5 to 3 mm. long, 1-nerved; second glume 3 to 3.5 mm. long, 3-nerved, the first narrowly, the second broadly ovate-lanceolate, acute, smooth; lemmas 3 to 4 mm. long, 5-nerved, oblong, broadly obtuse, margins and apex subhyaline, pubescent on the keel and lateral nerves below, and slightly scabrous on the keel above, sparingly webby hairy at the base, otherwise smooth; palea purplish, lanceolate, equaling the lemma in length.

Type U. S. National Herbarium no. 376352, collected June 20, 1899, Hidden Glacier, Yakutat Bay, Alaska, by Coville & Kearney (no. 970).

In spikelet characters this plant approaches *P. cenisia* All., but it is at once distinguished from that species by its numerous thin, linear, basal leaves and very lax panicles.

EXPLANATION OF PLATE 15.—*a*, Plant; *b*, spikelet; *c*, glumes; *d*, single floret. *a*, Scale about ½; *b*, *c*, *d*, scale 8.

6. **Poa laxa** Haenke in Jirasek, Beob. Riesengeb. 118. 1791.

A tufted, glabrous, lax perennial, 10 to 30 cm. high, with narrow leaves and open panicles 2 to 8 cm. long, the slender, usually ascending branches bearing a few spikelets above, naked below; spikelets 3 to 5-flowered, 4 to 5 mm. long; lemmas 3 to 4 mm. long, the keel and marginal nerves silky-pilose below, webbed at the base.

Seward Peninsula to Prince William Sound and eastward to Greenland, south in the mountains to New England and Colorado.

SPECIMENS EXAMINED: Port Clarence, *Trelease & Saunders* 2961, *Coville & Kearney* 1925; Prince William Sound, *Trelease & Saunders* 2972.

7. **Poa triflora** Gilib. Exerc. Phyt. **2:** 531. 1790. FOWL MEADOW GRASS.

*Poa serotina* Ehrh. Beitr. Naturk. **6:** 83. 1791, nomen nudum.

An erect, glabrous perennial 40 to 120 cm. high, with narrow leaves and diffuse, usually open panicles 15 to 30 cm. long, the branches spreading or ascending, 5 to 12 cm. long, divided and spikelet-bearing above the middle; spikelets 3 to 5-flowered, 3 to 4 mm. long, usually exceeding their pedicels; lemmas 2 to 3 mm. long, the keel and marginal nerves silky-pubescent below, slightly webbed at the base, the intermediate nerves obscure or wanting.

In swampy places, July and August, southeastern Alaska to Nova Scotia, south to New Jersey, Nebraska, and Colorado; also in Europe and Asia.

SPECIMEN EXAMINED: Bella-bella Island (near Vancouver Island), *Kellogg* 97.

8. **Poa nemoralis** L. Sp. Pl. 69. 1753.

An erect, glabrous, tufted perennial, 20 to 60 cm. high, with narrow leaves, short ligules, and lanceolate panicles 5 to 12 cm. long, the branches naked below, erect or ascending, rarely spreading, 2 to 5 cm. long; spikelets 2 to 5-flowered, 3 to 4 mm. long; lemmas 2 to 2.5 mm. long, faintly 5-nerved, somewhat webbed at the base and silky-pubescent on the keel and marginal nerves below.

Aleutian Islands and Alaska Peninsula, eastward to Newfoundland and southward; also in Europe and Asia.

SPECIMENS EXAMINED: Unalaska, *Coville & Kearney* 1770, *Piper* 4770; Shumagin Islands, Popof, *Trelease & Saunders* 2975, *Saunders* in 1899; Kodiak Island, *Trelease & Saunders* 2940, *Piper* 4744, 4745, 4746, 4747, 4748, 4749, 4763; Kukak Bay, *Coville & Kearney* 1500.

The material here referred to *Poa nemoralis* is scarcely typical of that species, but in the present state of our knowledge concerning this extremely difficult genus we have considered it advisable so to refer it.

9. **Poa trivialis** L. Sp. Pl. 67. 1753.

An erect, usually slender, perennial, 30 to 90 cm. high, with flat leaves and open, many-flowered panicles, 6 to 15 cm. long; sheaths slightly scabrous; ligule 4 to 6 mm. long; culms usually rough below the panicle; spikelets 2 or 3-flowered, about 3 mm. long; glumes very acute; lemmas prominently 5-nerved, silky-pubescent on the keel below and with long, cobwebby hairs at the base.

In meadows and along roadsides, Aleutian Islands and southeastern Alaska to Newfoundland and southward; also in Europe and Asia.

SPECIMENS EXAMINED: Atka Island, *Turner* 1198, common; Sitka, *Wright* 1583, in drier places in shelter of young evergreen trees, *Piper* 4741; Wrangell, *Evans* 148, abundant in cleared ground.

10. **Poa pratensis** L. Sp. Pl. 67. 1753. KENTUCKY BLUEGRASS.

An erect, stoloniferous perennial, 30 to 120 cm. high, with narrow, flat leaves and more or less spreading, usually pyramidal, panicles, 5 to 20 cm. long; spikelets 3 to 5-flowered, 4 to 5 mm. long, exceeding their pedicels; glumes acute; lemmas 3 mm. long, with abundant cobwebby hairs at the base, the keel and marginal nerves silky-pubescent below, the intermediate nerves naked.

Fields and meadows, from the Yukon valley southward and eastward to Newfoundland; also in Europe and Asia.

11. **Poa rotundata** Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **1**: 378. 1830.

A pale, slender, cespitose perennial, 30 to 70 cm. high, with elongated, linear, thin culm leaves and lanceolate few-flowered panicles 10 to 15 cm. long, the scabrous, slender, somewhat flexuous, ascending branches naked below, flower-bearing above; ligule 2 to 3 mm. long; culm leaves 10 to 15 cm. long; 1 to 1.5 mm. wide, plane, glabrous; spikelets 4 to 5 mm. long, 3 or 4-flowered; glumes lanceolate, acuminate, glabrous, the second about 0.5 mm. longer than the first, this 2.5 to 3 mm. in length; lemmas lanceolate, acute, about 3 mm. long, glabrous, except on the keel and marginal nerves, these silky-villous below but scarcely webbed.

Upper Yukon, Aleutian Islands, and southeastern Alaska.

SPECIMENS EXAMINED: Unalaska, *Mertens*, cotype (from Herb. Acad. St. Petersb.); Juneau, *Cole* in 1899, *Coville & Kearney* 2479; Eagle, *Georgeson* 28, a form with larger spikelets than in the type.

A valid species recognized by its lax habit, elongated, narrow leaves, and lax panicles. The spikelets in anthesis are somewhat circular in outline, whence the name.

12. **Poa leptocoma** Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **1**: 374. 1830.

*Poa stenantha leptocoma* Griseb. in Ledeb. Fl. Ross. **4**: 372. 1853.

A lax, pale green, glabrous perennial 30 to 50 cm. high, with thin, glabrous leaves 5 to 12 cm. long and 2 to 4 mm. wide, and lax, flexuous panicles 5 to 10 cm. long, the

slender, glabrous branches naked below, bearing a few spikelets above the middle, the lower ones often 6 cm. long, spreading or ascending; spikelets 5 to 6 mm. long, 2 or 3-flowered, the glabrous pedicels exceeding the spikelets; glumes lanceolate, acuminate, glabrous, the first 2.5 mm. long, the second 3 mm. long, faintly 3-nerved; lemmas narrowly lanceolate, acuminate, about 3.5 mm. long, obscurely 5-nerved, somewhat villous on the keel and marginal nerves below, webbed at the base, the hairs as long as the lemma or longer, otherwise glabrous; palea nearly equaling the lemma, slightly scabrous on the keels.

Sitka and southward to Washington and (?) Colorado.

SPECIMEN EXAMINED: Sitka, *Mertens* (from Herb. Acad. St. Petersb.).

We have seen no Alaskan material representing this species other than the fragment in the U. S. National Herbarium from the type collection, and also a similar specimen in the Bernhardi Herbarium in the collections of the Missouri Botanical Garden. Both these specimens are of the form *a*, which we consider to represent the species, as the form *β* from Kamtchatka is evidently a different species, approaching *Poa arctica* R. Br. The present species is distinguished by its slender habit, thin, pale green leaves, lax few-flowered panicles, and narrow, acuminate lemma; in many respects it resembles *Poa reflexa* Vasey & Scribn.

12a. **Poa leptocoma elatior** subsp. nov.

A tall form 80 to 90 cm. high, with ample spreading panicles about 20 cm. long, the scabrous branches 7 to 10 cm. long, bearing few spikelets, these somewhat larger than in the species; leaf blades 10 to 15 cm. long, 5 mm. wide; spikelets 3-flowered, 6 mm. long, the lemmas distinctly nerved, 4.5 mm. long. Perhaps this may prove to be a good species.

Type U. S. National Herbarium no. 376602, collected July 26, 1899, Cape Fox, *Trelease & Saunders* (no. 2982).

Southeastern Alaska.

SPECIMENS EXAMINED: Cape Fox, *Trelease & Saunders* 2982; Hot Springs, *Howell* 1719.

13. **Poa stenantha** Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **1**: 376. 1830.

*Poa flavicans* Ledeb. Fl. Ross. **4**: 373. 1853.

A slender, erect, glabrous perennial 30 to 70 cm. high, with thin, narrow, ascending leaves and elongated, narrow, pale or usually purplish, somewhat nodding, panicles 15 cm. long or less, the scabrous branches ascending, naked below, the lower ones often 8 cm. long; leaf blades 1 to 3 mm. wide, mostly glabrous; ligule 3 to 4 mm. long; lemmas 4 to 6 mm. long, lanceolate, acute, villous on the keel and marginal nerves below, not webbed at the base, slightly scabrous above and sometimes slightly pubescent between the nerves below.

The Aleutian Islands and Alaska Peninsula to southeastern Alaska; also in northeastern Asia.

A variable species, evidently common in Alaska, in general recognized by its elongated, contracted, somewhat nodding panicles and the absence of cobwebby hairs at the base of the lemmas. We have not been able satisfactorily to separate *Poa flavicans* from *P. stenantha*, even by comparison of typical material of each from the herbarium of the St. Petersburg Academy of Sciences, and have accordingly reduced the former to a synonym of the latter. Piper's no. 4739 is exactly *Poa flavicans* Griseb. in Ledeb. Fl. Ross.

13a. **Poa stenantha vivipara** Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **1**: 376. 1830.

A form with the habit and vegetative characters of the species, but with many of the lemmas developed into leaflets.

Norton Sound to the Aleutian Islands and southeastern Alaska.

14. **Poa acutiglumis** Scribn. U. S. Dept. Agr. Div. Agrost. Circ. **9**: 4. 1899.

A tufted, glabrous perennial, 50 to 70 cm. high, with rather short, narrow and soft radical leaves and open, pale or purplish, ovate panicles, about 10 cm. long, the scabrous, spreading, or ascending branches naked below, the lower ones 5 to 6 cm. long; spikelets lanceolate, remotely 4 to 6-flowered, 8 to 11 mm. long, glumes unequal, the second about 5 mm. long; lemmas about 5 mm. long, narrowly oblong-lanceolate, acute, rough-hispid on the back, and with a short crisp pubescence at the base and on the lower half of the nerves; palea conspicuously ciliate on the keels and sparsely pubescent near the base.

Southeastern Alaska and southward to Oregon.

SPECIMEN EXAMINED: Juneau, *Coville & Kearney* 2517.

The Alaska specimen cited is somewhat smaller than the type of *P. acutiglumis*, with slightly shorter ligule and less scabrous spikelets. It is the same as Henderson's no. 9 from Oregon, in U. S. National Herbarium.

15. **Poa turneri** Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **8:** 5. *pl. 1*. 1897.

A rather stout, glabrous, stoloniferous and apparently dicœcious perennial 40 to 70 cm. high, with soft flat leaves and more or less spreading and nodding panicles 8 to 15 cm. long, of rather large, compressed 3 to 6-flowered spikelets about 9 mm. long; glumes subequal, both 3-nerved, about equaling the lowest lemma, this about 7 mm. long, densely pilose on the keel and marginal nerves below, and with a tuft of long cobwebby hairs at the base.

Aleutian Islands and Cook Inlet, Alaska.

SPECIMENS EXAMINED: Atka Island, *Turner* 1185 (type), 1200, 1206 in part; Kasilof, *Evans* 615.

A species similar to *Poa hispidula*, but distinguished by its more open and lax panicles, larger spikelets and longer, narrower, more acute glumes and lemmas.

16. **Poa lanata** sp. nov. PLATE 16.

A slender, erect perennial 25 to 40 cm. high, from creeping rootstocks, with narrow, linear, rigid leaves and open, rather few-flowered panicles 5 to 7 cm. long; sheaths rather loose, the lower ones imbricate and marcescent, decidedly scabrous, or the upper one nearly smooth; ligule about 4 mm. long, hyaline, obtuse, and generally somewhat lacerate; basal leaves and those of the innovations 6 to 12 mm. long, 2 to 4 mm. wide, glaucous, glabrous except on the scabrous margin, folded or involute, acute and hooded at the apex, the culm leaves generally but one, shorter; panicle somewhat exserted, pyramidal, lax; branches mostly in pairs, spreading, the lower ones 2 to 3 cm. long, naked below, bearing from 1 to 3 spikelets near the apex; pedicels scabrous, spikelets ovate, acute, purple, compressed, 8 to 10 mm. long, 3 to 6-flowered; first glume 5.5 mm. long; second glume 6 to 6.5 mm. long, both acute, 3-nerved, scabrous on the keel, minutely and sparingly strigose throughout; lemmas 6 to 7 mm. long, purple, with broad hyaline margins, 5-nerved, obtuse, densely webby hairy in the lower half, strigose above, scabrous on the keel; palea nearly equaling the glume.

Type U. S. National Herbarium no. 376421, collected July 17, 1899, Aleutian Islands, by Coville & Kearney (no. 2191).

SPECIMENS EXAMINED: Unalaska, *Piper* 4764, 4752, 4755, 4758; Aleutian Islands, *Coville & Kearney* 2191. Differs from *Poa cenisia* All. and *Poa arctica* R. Br. in the characters of its leaves and sheaths, and in the larger and more densely pubescent lemmas. Apparently closely related to *Poa gelida* Roem. & Schult. from Greenland, so far as can be determined from the description of that species, but differs in certain sheath, panicle, and spikelet characters.

EXPLANATION OF PLATE 16. *a*, Plant; *b*, glumes; *c*, three florets of a spikelet. *a*, Natural size; *b*, scale about 5; *c*, scale about 4. Drawn from the type specimen.




POA LANATA SCRIBN. & MERR.

17. **Poa trinii** sp. nov.

*Poa rigens* Trin.; Griseb. in Ledeb Fl. Ross. **4:** 393. 1853, as synonym, not Hartm. 1820.

A robust, erect, glabrous perennial about 60 cm. high, with firm, rigid, mostly plane leaves and ovate, very densely flowered panicles 8 to 10 cm. long, 2 to 4 cm. in diameter; culms and sheaths glabrous, the latter shorter than the internodes, rather loose; ligule a cartilaginous ring 1 to 2 mm. long; leaf blades 10 to 15 cm. long, 5 to 8 mm. wide, erect or ascending, glabrous except on the scabrous margins; panicles very densely flowered, the axis and branches glabrous, the latter appressed or ascending, flower-bearing throughout, the lower ones 3 to 4 cm. long; spikelets 6 to 7 mm. long, 3 or 4-flowered; glumes broadly lanceolate, abruptly acute, the first 4.5 mm. long, the second 3-nerved, 5 to 5.5 mm. long; lemmas lanceolate, about 5.5 mm. long, 5-nerved, abruptly acute, very scabrous throughout, with numerous basal hairs about 1 mm. long, and also usually somewhat silky-hairy on the keel and marginal nerves below.

*Poa rigens* was a herbarium name and was never published by Trinius, although specimens were distributed under it. There is in the Gray Herbarium a specimen bearing the following printed label: "*Poa rigens* Trin. Kamtsch.," and in writing: "Comm. Acad. Petr. 1835," which is the type of our species, and which is doubtless of the same collection that Grisebach observed in the herbarium of Ledebour and which he reduced to *Glyceria glumaris* (*Poa eminens* Presl). *Poa trinii* is, however, very distinct from that species, being readily recognized by its smaller spikelets, and especially by its very densely flowered ovate panicles.

Norton Sound, islands of the Bering Sea, and Shumagin Islands.

SPECIMENS EXAMINED: St. Michael Island, *Turner* 6, common on dry hillside; Nagai Island, *Harrington* in 1871–72; without locality, *Dall* in 1873.

18. **Poa eminens** Presl, Rel. Haenk. **1:** 273. 1830.

*Poa glumaris* Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **1:** 379. 1830.

*Glyceria glumaris* Griseb. in Ledeb. Fl. Ross. **4:** 392. 1853.

A stout, erect, glabrous, glaucous perennial 30 to 90 cm. high, from strong creeping rootstocks, with thick, flat leaves 15 to 25 cm. long, 6 to 10 mm. wide and many-flowered panicles 10 to 20 cm. long, the branches spreading or ascending, fasciculate, glabrous, often 8 to 10 cm. long; spikelets 3 to 5-flowered, 8 to 12 mm. long, with nearly equal glabrous glumes, the second 7 to 8 mm. long, somewhat exceeding the first; lemmas strongly scabrous, 5 to 7 mm. long, pubescent on the keel and margins below, not webbed.

In damp soil and in sands along the coast from the Aleutian Islands to southeastern Alaska, and southward to California; also on the northern Atlantic coast.

SPECIMENS EXAMINED: *Turner* 1206 in part; St. Paul Island, *Macoun* 16631; Nushagak, *Winneman* in 1884, *McKay* in 1881; Popof Island, *Saunders* in 1899, *Trelease & Saunders* 2919; Seldovia, *Piper* 4767; Shumagin Islands, *Harrington* in 1871–72, *Trelease & Saunders* 2977; Cape Fox, *Trelease & Saunders* 2920; Homer, *Evans* 472, *Piper* 4765; Kasilof, *Evans* 692; Kodiak, *Piper* 4766, 4768; between Cook Inlet and Tanana River, *Glenn* in 1899; Virgin Bay, *Coville & Kearney* 1210; Yakutat Bay, *Trelease & Saunders* 2923, 2924; Unalaska, *Coville & Kearney* 1750, *Harrington* in 1871–72; Tatitlak, *Evans* 273; without locality, *Funston* 137.

Presl's name being the earliest available one for this species, it is here taken up, as there is no doubt as to the identity of his species. *Poa eminens* is a most distinct species, readily recognized by its coarse, rigid culms and leaves, and large panicles and spikelets.

### SPECIES OF POA ERRONEOUSLY ASCRIBED TO ALASKA.

In addition to the Alaskan species of Poa enumerated above many other species have been reported from that region, chiefly, we believe, on misconception of species and erroneous determinations. Specimens reported as *Poa cenisia* All. are doubtless *Poa arctica* R. Br.; *Poa cenisia* is not found in North America. *Poa bulbosa vivipara* Bess., reported by Durand, is *Poa stenantha vivipara* Trin. *Poa caesia* J. E. Smith is reported from Alaska by Grisebach and Macoun, but evidently on a misconception of the species. *Poa pratensis alpigena* Fries, a variety unknown to us, is reported from Port Clarence by Kjellman.[a] *Poa flexuosa* Wahl., formae *genuina* and *typica*, is reported from the same locality by Kjellman,[b] as are also *Poa glauca* Vahl, and *Poa glauca elatior* Anderss., evidently, however, on erroneous determinations. *Poa flexuosa* of Trinius from Sitka is *Poa arctica* R. Br., at least, in part. *Poa abbreviata* R. Br.[c] is also reported[d] as being collected by Beechey at Kotzebue Sound, but we have seen no Alaskan specimens of this grass.

## 19. COLPODIUM Trin.

*Colpodium* Trin. Fund. Agrost. 119. 1820.
*Arctophila* Rupr. Fl. Samoj. Cisural. 62. 1845.

Spikelets 2 to 7-flowered; glumes thin-membranaceous, 1 to 3-nerved or nerveless, obtuse, usually shorter than the lemmas; lemmas thin-membranaceous with broad scarious margins, obtuse, very obscurely 5-nerved; rachilla and callus glabrous or (in Section Arctophila) the callus pilose with rather short, stiff hairs.

Leaf blades 3 to 6 mm. wide; lemmas glabrous ..... 1. *C. fulvum.*
Leaf blades 2 mm. wide or less; lemmas silky-pubescent below..... 2. *C. wrightii.*

1. **Colpodium fulvum** (Trin.) Griseb. in Ledeb. Fl. Ross. **4:** 385. 1853.
*Poa fulva* Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **1:** 378. 1830.
*Arctophila fulva* Rupr. Fl. Samoj. Cisural. 64. 1845.
*Graphephorum fulvum* A. Gray, Proc. Amer. Acad. **5:** 191. 1862.

A rather stout, erect, leafy, and glabrous plant, 20 to 60 cm. high, with flat leaves and open panicles 8 to 15 cm. long, the upper ones longest; spikelets 3 to 7-flowered, 5 to 7 mm. long; lemmas broadly obtuse, about 4 mm. long.

Arctic Alaska to the Pribilof and Shumagin islands, thence to southeastern Alaska and British Columbia. Type locality Eschscholtz Bay, Kotzebue Sound.

SPECIMENS EXAMINED: Shumagin Islands, *Harrington* in 1871–72; Port Clarence, *Walpole* 1634, 1659, 1670, 1715, 1919, 2004; St. George Island, *Merriam* in 1891; St. Paul Island, *Macoun* in 1892, *Palmer* 496; Nushagak, *Havard* in 1881; Point Barrow, *Murdoch* in 1882 and 1883; near Nome City, *Flett* 1688; Point Gustavus, Glacier Bay, *Coville & Kearney* 712; Seward Peninsula, abundant at Mud Lake on Portage, *Collier* in 1900.

This species may prove to be identical with *Arctophila effusa* Lange. *Colpodium mucronatum* Beal,[e] is based upon an immature and apparently somewhat abnormal plant in which the midnerve is more strongly developed than usual.

2. **Colpodium wrightii** sp. nov.

A densely cespitose, slender, glabrous perennial 30 to 50 cm. high, with numerous rather short, linear, involute basal leaves and exserted, open, purplish panicles 4 to 9 cm. long; sheaths crowded and marcescent below; ligule about 3 mm. long, acute; basal leaves about 5 cm. long, 1 mm. wide or less, those of the culm shorter; panicle

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[a] Nordenskiold, Vega-Exped. **2:** 54. 1883.
[b] Loc. cit.
[c] Suppl. App. Parry's Voy. 287. 1824.
[d] Griseb. in Ledeb. Fl. Ross. **4:** 377. 1853.
[e] Grasses N. Amer. **2:** 558. 1896.

branches glabrous, the lower ones usually in pairs, spreading or ascending, 3 to 4 cm. long, bearing a few flowers toward the apex; naked below; spikelets 3 or 4-flowered, 6 to 8 mm. long, purplish; glumes unequal, the first 1.5 to 2.5 mm. long, the second about 2.5 to 3.5 mm. long, obtuse, 3-nerved; lemmas lanceolate, somewhat obtuse, 4.5 to 5 mm. long, rather prominently 5-nerved, appressed silky-pubescent on the back toward the base, glabrous above; palea equaling the glume, the keels scabrous.

Type U. S. National Herbarium no. 592344, collected by C. Wright on Arakamtchetchene, or Kayne Island (Siberia), on the Pacific Exploring Expedition under Commanders Ringgold and Rodgers, 1853–56. Distributed as "*Glyceria arctica* Hook."

This was also secured at Port Clarence, by F. A. Walpole in low sandy tundra, 1891, 1893, and 1901, forms with less pubescent glumes than the type. A peculiar species approaching Poa, but apparently quite closely related to *Colpodium humile* Griseb. (*C. bulbosum* Trin.), differing in its greater size and the pubescence of the longer lemmas. The base of the culms in our species is somewhat thickened, as in *C. humile*.

2a. **Colpodium wrightii flavum** subsp. nov.

Panicles bright yellow, otherwise as in the species.

Type, U. S. National Herbarium no. 379007, collected August 21, 1901, low sandy tundra, Port Clarence, by F. A. Walpole (no. 1891a), the only specimen seen.

COLPODIUM PENDULINUM (Vahl) Griseb. is reported from Alaska, mouth of the Klondike, *R. S. Williams* [a] in 1899, but we have seen no specimens of this species from Alaska, and accordingly have not admitted it.

## 20. DUPONTIA R. Br.

*Dupontia* R. Br. Suppl. App. Parry's Voy. 290. 1824.

Spikelets 2 to 5-flowered, hermaphrodite; rachilla articulated above the glumes, the callus of the lemmas distinctly hairy; glumes 2, membranaceous, awnless, exceeding the lemma, this attenuate-pointed and entire, or finely and minutely toothed at the apex. Low arctic grasses with flat leaves and small narrow or spreading panicles.

Lemmas pilose below ..... 1. *D. fischeri.*
Lemmas glabrous ..... 2. *D. psilosantha.*

1. **Dupontia fischeri** R. Br. Suppl. App. Parry's Voy. 291. 1824.

*Melica fischeri* Spreng. Syst. Veg. **2:** 32. 1827.

*Dupontia fischeri flavescens* Hook. & Arn. Bot. Beechey Voy. 132. 1841.

*Graphephorum fischeri* A. Gray, Proc. Amer. Acad. **5:** 191. 1862.

A slender, erect perennial, 10 to 25 cm. high, with flat leaves and contracted simple panicles 4 to 7 cm. long; spikelets 2 or 3-flowered, 6 to 7.5 mm. long, with lanceolate acute glumes and obtuse or acute lemmas, the latter silky-pilose on the back toward the base.

In moist soils, arctic Alaska and Seward Peninsula; also Europe and Asia.

SPECIMENS EXAMINED: Point Barrow, *Murdoch* in 1891; Port Clarence, *Walpole* 1630, 2017.

2. **Dupontia psilosantha** Rupr. Fl. Samoj. Cisural. 65. *pl. 6.* 1845.

*Poa psilosantha* Rupr. loc. cit.

*Graphephorum psilosanthum* Fourn. Bull. Soc. Bot. France **24:** 182. 1877.

*Graphephorum fischeri psilosanthum* A. Gray, Proc. Amer. Acad. **5:** 191. 1862.

A slender, erect, glabrous perennial 15 to 40 cm. high, with flat leaves and panicles 7 to 12 cm. long, their branches spreading, at least in flower; spikelets 6 to 7 mm. long, with attenuate-pointed glabrous lemmas.

In moist soils, Seward Peninsula and Pribilof Islands; also in Europe and Asia.

SPECIMENS EXAMINED: St. Paul Island, *Macoun* 16225; Port Clarence, *Walpole* 1792, 1822, 1882, 1982.

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[a] Nash, Bull. N. Y. Bot. Gard. **2:** 157. 1901.

## 21. **PANICULARIA** Fabr.

*Panicularia* Fabr. Enum. Pl. Hort. Helmst. ed. 2. **2:** 373. 1763.
*Glyceria* R. Br. Prodr. Fl. Nov. Holl. 179. 1810.

Spikelets few to many-flowered, terete or slightly flattened, in narrow or spreading panicles; rachilla articulated above the glumes and between the florets, usually smooth; glumes unequal, shorter than the lemmas; lemmas smooth or scabrous, rounded on the back, 5 to 9-nerved, the nerves mostly prominent. Usually tall, aquatic, perennial grasses with flat leaves and terminal panicles.

Spikelets 10 to 18 mm. long; panicles narrow..... 1. *P. borealis.*
Spikelets 3 to 6 mm. long; panicles diffuse.
  Leaves broad and comparatively short; ligule 10 to 12 mm. long; spikelets crowded at the ends of the flexuous branches. 2. *P. pauciflora.*
  Leaves elongated; ligule about 4 mm. long; spikelets not crowded..... 3. *P. americana.*

1. **Panicularia borealis** Nash, Bull. Torrey Club **24:** 348. 1897.
*Glyceria fluitans angustata* Vasey, Proc. Portland Soc. Nat. Hist. **2:** 91. 1895, not *G. angustata* Fries, 1869.
*Glyceria borealis* Batch. Proc. Manchester Inst. Arts Sci. **1:** 74. 1900.

A slender, glabrous perennial 40 to 150 cm. high, with flat leaves and narrow panicles 10 to 40 cm. long; spikelets 10 to 18 mm. long, 7 to 13-flowered, the lemmas hispidulous on the nerves only. Related to *Panicularia septentrionalis* Hitchc.

Margins of streams and ponds, southeastern Alaska, south and east to Washington, New England, and New York.

SPECIMEN EXAMINED: Yes Bay, Behm Canal, by small lakes, *Howell* 1717.

*Panicularia borealis* Nash is very near *Panicularia plicata* (Fr.) (*Glyceria plicata* Fries)[a] being distinguished by its somewhat longer, more sharply nerved, and more acute lemmas.

2. **Panicularia pauciflora** (Presl) Kuntze, Rev. Gen. Pl. **2:** 783. 1891.
*Glyceria pauciflora* Presl, Rel. Haenk. **1:** 257. 1830.
*Glyceria spectabilis flaccida* Trin.; A. Gray, Proc. Acad. Phila. **1862:** 336. 1862.

A rather stout, glabrous perennial 60 to 120 cm. high, with broad leaves, long ligules and diffuse panicles 10 to 20 cm. long; leaf blades 10 to 30 cm. long, 1 to 2 cm. wide; ligules 10 to 12 mm. long; spikelets 5 or 6-flowered, 3 to 5 mm. long, mostly crowded or subfasciculate at the ends of the branches; glumes broadly obtuse, the first about 1.5 mm. long, the second 2 mm. long; the lemmas 2.5 to 3 mm. long, prominently 5-nerved, scabrous on the back, with a broadly obtuse scarious and erose apex.

In damp soils and in bogs, Cook Inlet, Yakutat Bay, and southeastern Alaska, southward to Colorado and California.

SPECIMENS EXAMINED: Lawson Bay, *Kellogg* 183; Latouche, *Piper* 4660; Foggy Bay, near Cape Fox, *Coville & Kearney* 2570; Kasilof, *Evans* 788; Sitka, *Evans* 203, *Wright* 1581, 1591, *Piper* 4658; Yakutat, *Coville & Kearney* 2981, *Piper* 4657; Juneau, *Cole* in 1899, *Trelease & Saunders* 2944, *Coville & Kearney* 2530; Yes Bay, Behm Canal, *Howell* 1717*a*.

3. **Panicularia americana** (Torr.) MacM. Met. Minn. Val. 81. 1892.
*Poa aquatica americana* Torr. Fl. North. & Mid. U. S. **1:** 108. 1824.
*Glyceria grandis* S. Wats. in A. Gray, Man. ed. 6. 667. 1890.

A stout, coarse grass 90 to 150 cm. high, with rather broad flat leaves and ample, spreading panicles 20 to 40 cm. long; sheaths loose; ligule 2 to 4 mm. long, truncate: leaf blades 18 to 30 cm. long or more, 6 to 16 mm. wide, scabrous above, glabrous be-

[a] Mant. **3:** 176. 1842.

neath; ligule about 4 mm. long; spikelets 4 to 7-flowered, 4 to 6 mm. long; pedicels glabrous; glumes 1-nerved, acute; lemmas about 2 to 2.5 mm. long, 7-nerved, very minutely and closely punctate, scabrous on the back, obtuse.

Cook Inlet and southeastern Alaska, eastward and southward to California, Pennsylvania, and Tennessee.

SPECIMENS EXAMINED: Homer, *Piper* 4659; Red Mountain, *Gorman* 1104.

PANICULARIA PULCHELLA Nash, Bull. N. Y. Bot. Gard. **2:** 157. 1901, was based upon specimens collected by R. S. Williams, White River, Alaska, August 17, 1899, which we have not seen.

GLYCERIA NERVATA Willd. is reported from Lawson's Bay by Durand[a] but the specimen is doubtless *Panicularia borealis* Nash.

GLYCERIA SPECTABILIS is also reported by various authors, and *Glyceria remota* Fries is reported from Sitka,[b] but the specimens cited are *Panicularia pauciflora*.

## 22. PUCCINELLIA Parl.

*Puccinellia* Parl. Fl. Ital. **1:** 366. 1848.
*Atropis* Rupr. Fl. Samoj. Cisural. 61. 1845.

Spikelets as in Panicularia, but with the lemmas usually smaller, nerves less distinct or obscure, and lodicules more hyaline and distinct. Grasses chiefly confined to the seacoast or to the alkaline regions of the interior.

Panicles contracted, the branches erect, mostly densely flowered.
- Lemmas appressed-ciliate on the nerves below..... 3. *P. alaskana*.
- Lemmas glabrous.
  - Culms 6 cm. high or less, stoloniferous..... 2. *P. phryganodes*.
  - Culms 10 cm. high or more, not stoloniferous..... 1. *P. angustata*.

Panicles open, the branches few-flowered, spreading or ascending.
- Lemmas 2 mm. long..... 4. *P. tenuiflora*.
- Lemmas 3 to 4 mm. long..... 5. *P. maritima*.

1. **Puccinellia angustata** (R. Br.) Nash, Bull. Torrey Club **22:** 512. 1895.
*Poa angustata* R. Br. Suppl. App. Parry's Voy. 287. 1824.
*Poa nutkaensis* Presl, Rel. Haenk. **1:** 272. 1830.[c]
*Atropis angustata* Griseb. in Ledeb. Fl. Ross. **4:** 390. 1853.
*Puccinellia maritima minor* S. Wats. in A. Gray, Man. ed. 6. 668. 1890.
*Glyceria arctica* Hook. Fl. Bor. Amer. **2:** 248. 1840.
*Glyceria maritima arctica* F. Kurtz, Bot. Jahrb. Engler **19:** 423. 1894.

A glabrous tufted perennial, 10 to 30 cm. high, with usually overlapping sheaths, linear, mostly involute leaves, and contracted panicles 2 to 5 cm. long; spikelets 4 to 8 mm. long, 2 to 7-flowered; lemmas 2.5 to 3 mm. long, obtuse.

Along the coast from Seward Peninsula and the Shumagin Islands to southeastern Alaska, and eastward and southward to Hudson Bay, Greenland, and Maine; also in Europe and Asia.

SPECIMENS EXAMINED: Port Clarence, *Walpole* 1889; Aleutian Islands, *Turner* 1208; Shumagin Islands, Popof, *Trelease & Saunders* 2946; Nagai Island, *Harrington*, in 1871–72; Kukak Bay, *Coville & Kearney* 1588; Kodiak Island, *Coville & Kearney* 2240, *Trelease & Saunders* 2945, 2973, *Kincaid* in 1899, *Cole* in 1899; Long Island, near Kodiak, *Trelease & Saunders* 2942; Yakutat Bay, *Funston* 31, *Trelease & Saunders* 2939; Glacier Bay, *Trelease & Saunders* 2937; Sitka, *Coville & Kearney* 843, *Evans* 257, *Wright* 1585, 1593; Howkan, *Evans* 144; Yes Bay, Behm Canal, *Howell* 1718.

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[a] Rep. Supt. U. S. Coast Surv. **1867:** 324. 1869.
[b] Griseb. in Ledeb. Fl. Ross. **4:** 391. 1853.
[c] See also Scribner, Rep. Mo. Bot. Gard. **10:** 51. *pl. 51.* 1899.

2. **Puccinellia phryganodes** (Trin.)

*Poa phryganodes* Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **1:** 389. 1830.
*Catabrosa vilfoidea* Anderss. Öfv. Vet. Akad. Förh. **19:** 254. 1862.
*Glyceria vilfoidea* Fries, Öfv. Vet. Akad. Förh. **26:** 139. 1869.

A densely cespitose, glabrous, prostrate perennial with numerous, very short leaves 1 to 2 cm. long and creeping, geniculate culms 1.5 cm. long or less, the flowering culms about 5 cm. high, with a small, few-flowered contracted panicle 1 to 2 cm. in length; sheaths overlapping; spikelets 3 to 5 mm. long, few-flowered; lemmas 2.5 to 3 mm. long.

On saline sands and mud flats, Seward Peninsula and Pribilof; also in Spitzbergen.

SPECIMENS EXAMINED: Port Clarence, wet sand flats, *Walpole* 633, 1718; St. Paul Island, *Macoun* 16223 (sterile specimens).

A very distinct species, recognized at once by its prostrate habit. Specimens from Fries labeled *Glyceria vilfoidea*, collected in Spitzbergen in 1868, are apparently identical with our species, which is certainly *Poa phryganodes* Trin.

3. **Puccinellia alaskana** sp. nov.

A densely cespitose glabrous perennial 10 to 20 cm. high, with numerous rather soft, short, plane, glabrous leaves and small, contracted, densely flowered panicles 2 to 4 cm. long; sheaths overlapping, the upper one somewhat inflated; ligule about 2 mm. long; leaf blades linear, 1 to 2 mm. wide, 3 to 6 cm. long; panicles pale or purplish, the branches glabrous, appressed, rarely spreading, naked below, flower-bearing above; spikelets 4 to 6 mm. long, 3 to 5-flowered; glumes unequal, the first 1 mm. long, acute, the second 2 mm. long, 3-nerved, obtuse; lemmas about 2.5 mm. long, rather prominently 5-nerved and appressed-ciliate on the nerves below; palea equaling the lemma, the keels glabrous.

Type U. S. National Herbarium no. 592343, collected August 4, 1891, on St. Paul Island, Bering Sea, by C. Hart Merriam.

Seward Peninsula, islands of Bering Sea, and Pribilof Islands.

SPECIMENS EXAMINED: Port Clarence, tundra bank, *Walpole* 1015; St. Paul Island, *Merriam* in 1891, *Macoun* in 1892, *Trelease & Saunders* 2690; St. Matthew Island, *Cole* in 1899.

A species related to **Puccinellia vahliana** (Liebm.). (*Poa vahliana* Liebm. [a]); *Glyceria vahliana* Fries), but distinguished by its much smaller glumes, less pubescent and much smaller lemmas, larger size, and flat, more flaccid leaves. From *Puccinellia angustata* it is at once distinguished by the appressed-ciliate and rather prominent nerves of the lemmas.

4. **Puccinellia tenuiflora** (Griseb.)

*Atropis tenuiflora* Griseb. in Ledeb. Fl. Ross. **4:** 369. 1853.
*Glyceria distans tenuiflora* Turcz. loc. cit. as synonym.

An erect glabrous perennial 40 to 60 cm. high with linear leaves, usually effuse panicles and small spikelets; ligule 2 to 3 mm. long; leaf blades 6 to 9 cm. long, 1 to 2 mm. wide, usually involute; panicles 10 to 15 cm. long, the branches scabrous, capillary, spreading or ascending, few-flowered, the lower ones somewhat fasciculate, often 10 cm. long; spikelets 3 to 4 mm. long, 3 or 4-flowered; lemmas glabrous, 2 mm. long, the nerves very faint or wanting.

Upper Yukon and Saskatchewan; also in northern Asia.

SPECIMEN EXAMINED: Fort Yukon, *Bates* in 1889.

A distinct species, at once recognized by its effuse, almost capillary panicles and small lemmas.

5. **Puccinellia maritima** (Huds.) Parl. Fl. Ital. **1:** 370. 1848.

*Poa maritima* Huds. Fl. Angl. 35. 1762.

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[a] Fl. Dan. **14:** *pl. 2401*. 1845.

*Glyceria maritima* Mert. & Koch in Röhl. Deutschl. Fl. ed. 3. **1**: 588. 1823.

A glabrous, erect, or decumbent perennial 20 to 60 cm. high, with numerous linear, often involute leaves and open panicles 5 to 15 cm. long, the branches spreading or ascending, naked below, flower-bearing above; spikelets 3 to 8-flowered, 5 to 10 mm. long, the lemmas glabrous, about 3 mm. long.

In salt marshes and on sea beaches, Cook Inlet and Prince William Sound, southward to California, and on the eastern coast of North America from Nova Scotia to Rhode Island; also in Europe and Asia.

SPECIMENS EXAMINED: Cook Inlet, Halibut Cove, *Coville & Kearney* 2456; Kasilof, *Evans* 609, 684 (in no. 684 the lemmas are 3.5 mm. long; branches widely spreading); Tyonek, *Evans* 480; Prince William Sound, near Orca, *Coville & Kearney* 1336.

The Alaskan material here referred to *Puccinellia maritima* differs somewhat from our Atlantic coast plants and also from the European specimens so named, and may possibly be a distinct species, but for the present we deem it advisable to refer it all to *Puccinellia maritima*.

PUCCINELLIA DISTANS (L.) Parl. has been reported from Alaska by various authors, but it is very certain that this species does not extend to that region, the plants so named being referable to the form here considered as *P. maritima*. *Puccinellia festucaeformis* has also been reported, but the specimens so named are only a large form of *P. maritima*. This form is represented by the following specimens: Sitka, *Piper* 4697; Kodiak, *Piper* 4696, 4700, 4701; Aurora, *Piper* 4699; Skwashianski Bay (near Sitka), *Piper* 4698.

## 23. FESTUCA L.

*Festuca* L. Sp. Pl. 73. 1753.

Spikelets several-flowered, pedicellate in narrow and dense or loose and spreading panicles; rachilla articulated above the glumes and between the florets; glumes 2, unequal; lemmas rounded on the back, at least below, acute or tapering into a straight awn, faintly 3 to 5-nerved, not webbed at the base. Usually cespitose, perennial grasses of various habit.

Leaf blades flat, 5 to 8 mm. wide..... 1. *F. subulata.*
Leaf blades narrow, convolute, 2 mm. wide or less.
  Plants with creeping rootstocks, innovations extravaginal.
    Lemmas smooth or simply scabrous..... 3. *F. rubra.*
    Lemmas pubescent..... 3a. *F. rubra kitaibeliana.*
    Lemmas lanuginous..... 3b. *F. rubra lanuginosa.*
  Plants densely tufted, roots fibrous, innovations extravaginal.
    Leaves at length falling away from the persistent sheaths; palea bidentate..... 2. *F. altaica.*
    Leaves short and involute, not falling away from the sheaths; palea not bidentate..... 4a. *F. ovina brachyphylla.*

1. **Festuca subulata** Trin. in Bong. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **2**: 173. 1832.

*Festuca jonesii* Vasey, Contr. Nat. Herb. **1**: 278. 1893.

A glabrous, erect perennial 60 to 100 cm. high, with broad, plane leaves and ample, few-flowered, usually open panicles 15 to 30 cm. long, the lower branches often 15 cm. in length; leaf blades 10 to 20 cm. long, 6 to 10 mm. wide; spikelets 2 or 3-flowered; glumes unequal, subulate-pointed, lemmas 6 to 7 mm. long, glabrous or nearly so, bearing a slender awn about 1 cm. in length.

Southeastern Alaska, to the mountains of Washington. Type locality, Baranof Island.

SPECIMENS EXAMINED: Foggy Bay, *Coville & Kearney* 2572; Howkan, *Evans* 120; Yes Bay, Behm Canal, *Howell* 1721; Cape Fox, *Cole* in 1899.

2. **Festuca altaica** Trin. in Ledeb. Fl. Alt. **1:** 109. 1829.
*Festuca scabrella* Torr.; Hook. Fl. Bor. Amer. **2:** 252. 1840.
*Festuca subulata* Trin. err. det. Vasey, U. S. Dept. Agr. Div. Bot. Bull. **13:** *pl. 92.* 1893.

A densely cespitose perennial 30 to 80 cm. high, with numerous elongated, involute basal leaves and open, lax panicles of few large purplish spikelets; panicles 10 to 15 cm. long, the branches spreading, flexuous, often recurved, flower-bearing above the middle; spikelets 8 to 12 mm. long, 3 to 5-flowered.

In dry rocky soils from Seward Peninsula to the upper Yukon, Aleutian Islands, and southeastern Alaska; also in northern Asia.

A very striking species, evidently common throughout its range. In some respects it approaches *Festuca hallii* (Vasey) Piper, but it is evidently distinct from that species. It is recognized by its numerous long, nearly glabrous leaves and lax open panicles of rather large, usually purplish spikelets.

3. **Festuca rubra** L. Sp. Pl. 74. 1753.

An erect, glabrous perennial 30 to 70 cm. high, with creeping rootstocks, exserted, contracted or open panicles, 3 to 10 cm. long; lemmas about 6 mm. iong, scabrous, awned.

The Pribilof and Aleutian islands and the valley of the lower Yukon to southeastern Alaska thence eastward and southward to Labrador, Tennessee, and Colorado; also in Europe and Asia.

SPECIMENS EXAMINED: St. Paul Island, *Macoun* 16634; Yukon River, *Funston* 136; Atka, *Macoun* 42 in 1891; Unalaska, *Macoun* 41 in 1891, *Harrington* in 1871–72, *Piper* 4674; Long Island, near Kodiak, *Trelease & Saunders* 2998, *Coville & Kearney* 2403; Kenai, *Piper* 2675; Kodiak Island, *Georgeson* 9, *Piper* 4672; Homer, *Piper* 4677; Popof Island, *Trelease & Saunders* 2999, *Saunders* in 1899; Shumagin Islands, *Harrington* in 1871–72; Kasilof, *Evans* 616; Orca, *Piper* 4670; Sitka, *Wright* 1586; Foggy Bay, *Coville & Kearney* 2564, *Trelease & Saunders* 3002, 3003.

An exceedingly variable species having many synonyms. European botanists have recognized many varieties, differentiating them chiefly by leaf characters.

3a. **Festuca rubra kitaibeliana** (Schult.) Piper, Contr. Nat. Herb. **10:** 23. 1906.
*Festuca pubescens* Willd.; Link, Enum. Pl. **1:** 91. 1821, not Zea, 1817.
*Festuca kitaibeliana* Schult. Mant. **2:** 398. 1824.
*Bromus secundus* Presl, Rel. Haenk. **1:** 263. 1830.
*Festuca rubra pubescens* Vasey in Beal, Grasses N. Amer. **2:** 607. 1896.
*Festuca rubra secunda* Scribn. Rep. Mo. Bot. Gard. **10:** 39. *pl. 52.* 1899.

An erect, cespitose perennial 30 to 80 cm. high from a creeping rootstock, with narrow, involute leaves, exserted, mostly contracted panicles, and densely villous spikelets; innovation leaves 15 to 30 cm. long, glabrous, those of the culm much shorter; panicles 6 to 15 cm. long, the branches naked below, scabrous, mostly secund, the lower ones 4 to 5 cm. long; spikelets about 12 mm. long, 5 to 10-flowered; glumes glabrous, unequal, the second 5 to 6 mm. long, broadly lanceolate, the first shorter and narrowly lanceolate; lemmas 6 to 7 mm. long, lanceolate, acuminate into a straight awn 2 to 3 mm. long, very strongly villous throughout.

Dry soils and river banks from Seward Peninsula and the Pribilof Islands to the Aleutian Islands and Yakutat Bay, thence to Washington, Oregon, and Montana; also in Europe and northern Asia.

SPECIMENS EXAMINED: Port Clarence, *Walpole* 1636; St. Michael Island, *Turner* 9; Kasilof, *Evans* 603, 735; Homer, *Evans* 474; Cold Bay, *Piper* 4668; St. Paul Island,

*Macoun* in 1891 and 1897, 16634 in part; Kodiak Island, *Georgeson* 9 in part, *Trelease & Saunders* 3000, *Coville & Kearney* 2286; Kenai, *Piper* 4676; Shumagin Islands *Harrington* in 1871–72; Disenchantment Bay, *Trelease & Saunders* 2922; Unalaska, *Coville & Kearney* 2193, *Harrington* in 1871–72, *Piper* 4674.

This very distinct form is the European *Festuca rubra barbata* Hack. (*F. barbata* Schrank) and is readily distinguished by its very villous glumes and lemmas. The specimens collected by Harrington, Shumagin Islands, cited above, agree with Presl's type of *Bromus secundus* in the herbarium of the Missouri Botanical Garden.

A form with awnless lemmas comes from: Eagle, *Georgeson* 30.

3b. **Festuca rubra lanuginosa** Mert. & Koch in Röhl. Deutschl. Fl. ed. 3. **1:** 654. 1823.

*Festuca arenaria* Osbeck in Retz. Suppl. Prodr. Fl. Scan. **1:** 4. 1805, not Lam. 1791.

*Festuca rubra arenaria* Fries, Fl. Halland. 28. 1817.

*Festuca richardsoni* Hook. Fl. Bor. Amer. **2:** 250. 1840.

*Festuca lanuginosa* Scheele, Flora **1:** 63. 1844.

Lemmas densely villous; awns very short or wholly wanting.

Aleutian Islands, and in the arctic regions of both hemispheres.

SPECIMEN EXAMINED: Unimak Island, *Macoun* 22801.

The Richardson specimens from "the Arctic seacoast" are identical with arctic European specimens, agreeing with *F. rubra arenaria* forma *arctica* Hackel.[a]

4. **Festuca ovina** L. Sp. Pl. 73. 1753.

A densely cespitose grass 10 to 30 cm. high, with slender rigid culms, no running rootstocks, numerous involute basal leaves and simple panicles 3 to 8 cm. long; lemmas 4 mm. long or less, usually short-awned.

An extremely variable and widely distributed species presenting many puzzling forms. The Alaska specimens apparently all belong to the variety named below.

4a. **Festuca ovina brachyphylla** (Schult.) Piper, Contr. Nat. Herb. **10:** 27. 1906.

*Festuca brevifolia* R. Br. Suppl. App. Parry's Voy. 289. 1824, not Muhl. 1817.

*Festuca brachyphylla* Schult. Mant. **3:** 646. 1827.

*Festuca ovina brevifolia* Hack. Monogr. Fest. Eur. 117. 1882.

Culms 5 to 15 cm. high; basal leaves numerous, subsetaceous, short, 2 to 6 cm. long; ligule shortly biauriculate; panicle contracted, 2 to 3.5 cm. long; spikelets about 6 mm. long, green or more or less tinged with violet; lemmas 3 to 4 mm. long, smooth or slightly scaberulous, short-awned.

Seward Peninsula and the islands of Bering Sea to the Aleutian Islands and southeastern Alaska, thence southward to the mountains of Utah and Colorado; also in arctic and alpine regions of the Old World.

SPECIMENS EXAMINED: Port Lawrence, *Trelease & Saunders* 2990; St. Matthew Island, *Trelease & Saunders* 2991; Unalaska, *Trelease & Saunders* 2989, *Piper* 4669; Popof Island, *Kincaid* in 1899; Kodiak, *Trelease & Saunders* 2988, *Piper* 4674, 4678, *Evans* 422; Muir Glacier, *Trelease & Saunders* in 1899; Cold Bay, *Piper* 4673; Juneau, *Trelease & Saunders* 2987; St. Paul Island, *Macoun* 16633; Unalaska, *Harrington* in 1871–72, *Coville & Kearney* 2204; Kukak Bay, *Coville & Kearney* 1501, 1503; Prince William Sound, *Trelease & Saunders* 2992; Hidden Glacier, Yakutat Bay, *Coville & Kearney* 986; Disenchantment Bay, *Coville & Kearney* 1098.

Several other species and varieties of Festuca have been reported from Alaska by various authors, but in most cases manifestly based on wrongly determined material. "*Festuca scabrella*" Torrey, reported from Nushagak by Knowlton[b] is *F. altaica*, and *Festuca ovina duriuscula* (L.) A. Gray, and *F. ovina violacea* (Gaud.) Griseb., are reported by various authors, but the Alaskan material so named is here referred to

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[a] Monogr. Fest. Eur. 140. 1882.

[b] Proc. U. S. Nat. Mus. **8:** 220. 1885.

*Festuca ovina brachyphylla*. *Festuca rubra glabra* Trautv., reported from Port Clarence by Kjellman [a] is probably only a glabrous form of *Festuca rubra*.

## 24. BROMUS L.

*Bromus* L. Sp. Pl. 76. 1753.

Spikelets few to many-flowered, more or less compressed, usually paniculate; rachilla articulated above the glumes and between the florets; lemmas keeled or rounded on the back, usually awned from the apex. Annual or perennial grasses with flat leaves and rather large, erect or nodding spikelets.

Panicles erect or nearly so.
- Lemmas conspicuously pilose or pubescent.
  - Glumes glabrous or scabrous; lemmas pubescent only along the margins and at the base ..... 5. *B. pumpellianus*.
  - Glumes pubescent and also the lemmas.
    - Lemmas 12 to 14 mm. long; plants perennial ..... 6. *B. arcticus*.
    - Lemmas 8 to 11 mm. long; plants annual ..... 2. *B. hordeaceus*.
- Lemmas glabrous or merely scabrous.
  - Lemmas 6 to 8 mm. long, glabrous ..... 1. *B. racemosus*.
  - Lemmas about 15 mm. long, scabrous ..... 7. *B. aleutensis*.

Panicles nodding.
- Lemmas glabrous or scabrous ..... 8. *B. sitchensis*.
- Lemmas conspicuously pilose or pubescent.
  - Lemmas pubescent throughout; glumes pubescent .... 4. *B. pacificus*.
  - Lemmas pubescent only along or near their margins, and at the base; glumes not pubescent ..... 3. *B. richardsonii*.

1. **Bromus racemosus** L. Sp. Pl. ed. 2. 114. 1762.

An erect or ascending annual or biennial 30 to 70 cm. high with usually densely pilose-pubescent sheaths, simple panicles and acute 5 to 9-flowered spikelets 15 to 20 mm. long; lemmas elliptical, glabrous or scabrous, 6 to 8 mm. long, bearing a straight awn 5 to 8 mm. long; palea shorter than the lemma.

Sparingly introduced in various localities in North America, native in Europe and Asia.

SPECIMENS EXAMINED: We have seen no specimens of this grass from Alaska. It is, however, reported [b] as introduced at Dawson and collected by R. S. Williams in 1899.

2. **Bromus hordeaceus** L. Sp. Pl. 77. 1753.

*Bromus mollis* L. Sp. Pl. ed. 2. 112. 1762.

An erect or ascending annual, 20 to 80 cm. high, with flat, pubescent leaves and short and rather dense, erect panicles; sheaths retrosely pubescent with soft hairs; leaf blades 5 to 15 cm. long, 3 to 5 mm. wide; panicle contracted, 5 to 10 cm. long; spikelets ovate-lanceolate, 5 to 15-flowered; glumes broadly ovate, obtuse, coarsely pilose-pubescent; lemmas 8 to 11 mm. long, pilose, bearing a rather stout awn 6 to 9 mm. long.

Introduced at Yakutat in Alaska and in fields and waste places throughout the United States; native of Europe.

SPECIMEN EXAMINED: Yakutat, introduced, *Piper* 4683.

3. **Bromus richardsonii** Link, Hort. Berol. **2:** 281. 1833.

*Bromus purgans longispicata* Hook. Fl. Bor. Amer. **2:** 252. 1840.

An erect, robust perennial 60 to 130 cm. high with smooth culms, smooth or pilose sheaths and diffuse nodding panicles, 15 to 25 cm. long; spikelets 2 to 3 cm. long;

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[a] In Nordenskiold, Vega-Exped. **2:** 54. 1883.

[b] Nash, Bull. N. Y. Bot. Gard. **2:** 158. 1901.

lemmas 12 to 15 mm. long, appressed-pubescent from the second nerve to the margin and also across the base.

In damp soil and on shaded slopes, arctic Alaska to the Shumagin Islands and Cook Inlet, thence to Wyoming and Arizona.

SPECIMENS EXAMINED: Shumagin Islands, Popof, *Kincaid* in 1899; Kenai, *Piper* 4685; Chandlar (Gens de Large) River, *Schrader* in 1899; opposite Port Axel (Kachemak Bay?), *Piper* 4682.

4. **Bromus pacificus** Shear, U. S. Dept. Agr. Div. Agrost. Bull. **23:** 38. *f. 21.* 1900.

A stout, erect perennial 100 to 150 cm. high, with leafy culms, pubescent nodes, retrosely pilose sheaths, and large, dense, nodding panicles; spikelets 2 to 2.5 cm. long, coarsely pubescent throughout; lemmas 11 to 12 mm. long, the pubescence more dense and somewhat villous towards the base.

Moist thickets along the coast from Seward Peninsula to southeastern Alaska and southward to Oregon.

SPECIMENS EXAMINED: Prince of Wales Island, *Wright* 1595; Cape Nome, *Blaisdell* in 1900 (small form); Sitka, *Piper* 4684.

5. **Bromus pumpellianus** Scribn. Bull. Torrey Club **15:** 9. 1888.

A stout, erect perennial 60 to 120 cm. high, with creeping rootstocks, smooth or pubescent nodes and sheaths, and narrow, erect, panicles 10 to 20 cm. long; spikelets 2 to 3 cm. long; lemmas densely and coarsely pubescent along the margins and across the back at the base.

In moist, usually shaded soils, upper Yukon to North Dakota and Colorado.

SPECIMENS EXAMINED: Fort Yukon, *Bates* in 1889, *Georgeson* 17; Yukon River, *Dawson* 92 in part; Steamboat Slough (upper Yukon Valley), *Gorman* 1090; Fort Selkirk, *Tarleton* 135; Circle City, *Osgood* in 1899; Dawson, *Williams* in 1899.

5a. **Bromus pumpellianus tweedyi** Scribn. in Beal, Grasses N. Amer. **2:** 622. 1896.

A form differing from the species in its usually pilose-pubescent sheaths and leaves and lemmas with coarser, denser, and more hirsute pubescence.

Occurs with the species.

SPECIMEN EXAMINED: Yukon River, *Dawson* 92 in part.

6. **Bromus arcticus** Shear, sp. nov.

A rather stout, erect perennial 50 to 80 cm. high, from creeping rootstocks, with smooth or sparsely pilose-pubescent sheaths, broadly linear-lanceolate leaves, and rather narrow, erect, purplish panicles 10 to 20 cm. long; culms slightly pubescent at the nodes; ligule membranous, laciniate-dentate, 1 to 2 mm. long; leaf blades scabrous, usually more or less pilose-pubescent on the nerves, 15 to 25 cm. long, 5 to 8 mm. wide; panicles purplish, the lower branches 1 to 3 at each node, 3 to 10 cm. long, spreading in flower, erect or ascending at maturity; spikelets 6 to 10-flowered, 2 to 4 cm. long, 5 to 7 mm. wide, laterally compressed in flower; glumes coarsely pubescent, the first 1-nerved or sometimes with two faint lateral nerves, sharply acuminate, 8 to 9 mm. long, the second broader, 3-nerved, 11 to 12 mm. long; lemmas ovate-lanceolate, subacute, 5-nerved, 12 to 14 mm. long, rather densely and coarsely pubescent over the whole exterior, awned from the emarginate apex; awns about 2 mm. long; palea shorter than the lemma, about 10 mm. long; rachilla slender, pilose-pubescent.

Type U. S. National Herbarium no. 379157, collected September 9, 1901, tundra bank, Teller Reindeer Station, Port Clarence, by F. A. Walpole (no. 2066).

SPECIMENS EXAMINED: Port Clarence, *Walpole* 2066; without locality, *Schrader* in 1901.

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This species is evidently related to *Bromus pumpellianus*, from which it is distinguished by its less robust habit of growth, pubescent glumes, and longer and narrower lemmas pubescent throughout.

7. **Bromus aleutensis** Trin.; Griseb. in Ledeb. Fl. Ross. **4**: 361. 1853.

A rather tall, stout perennial with lax, suberect panicles 12 to 20 cm. long, the lower branches bearing 1 to 3 somewhat nodding spikelets 2.5 to 3.5 cm. long; lemmas about 15 mm. long, 7-nerved, smooth or scabrous-pubescent and with broad, membranous margins.

In damp soil, Aleutian Islands.

SPECIMENS EXAMINED: Atka Island, *Turner* 1194; Unalaska, *Evans* 550, *Kellogg* 142, *Harrington* in 1871–72, *Coville & Kearney* 1727, 2196, *Applegate*, *Piper* 4680, 4681.

8. **Bromus sitchensis** Trin. in Bong. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **2**: 173. 1832.

A tall, stout, leafy perennial 120 to 180 cm. high, with smooth sheaths and lax, drooping panicles 25 to 35 cm. long, the lower branches 2 to 4, weak, spreading, usually bearing 1 to 3 spikelets on long slender pedicles; spikelets 2.5 to 3 cm. long; lemmas 12 to 14 mm. long, smooth or scabrous.

In damp soils near the coast, Aleutian Islands and southeastern Alaska to Oregon.

SPECIMENS EXAMINED: Yes Bay, Behm Canal, *Howell* 1722a; Unalaska, *Kellogg* 142; Hope Island (southeast Alaska), *Kellogg* 143; Foggy Bay, near Cape Fox, *Coville & Kearney* 2577; Sitka, *Piper* 4679.

### SPECIES OF BROMUS ERRONEOUSLY ASCRIBED TO ALASKA.

*Bromus purgans* L., *Bromus ciliatus* L., and *Bromus virens* Nutt., have been reported from Alaska in various published lists, but none of these species extend to Alaska. Alaskan specimens referred to the two former species are *Bromus pumpellianus*, *B. pacificus*, or *B. richardsonii*, while that reported as *Bromus virens* is doubtless *Bromus aleutensis*. *Bromus virens* Nutt. is a synonym of *Bromus carinatus hookerianus* (Thurb.) Shear, a form not found north of Washington.

## 25. AGROPYRON Gaertn.

*Agropyron* Gaertn. Nov. Comm. Petrop. **14**[1]: 539. *pl. 19. f. 4, 5.* 1770.

Spikelets 3 to many-flowered, closely sessile and solitary at each node of the axis; rachilla articulated above the glumes and between the florets; glumes 2, usually shorter than the lemmas, these rounded on the back or slightly keeled above, acute or awned from the apex. Perennial grasses with erect simple culms and terminal spikes.

Lemmas awnless, or if awned, the awn much shorter than the lemma.
- Lemmas very densely villous.
  - Plants glaucous; leaves involute, rigid; glumes glabrous or nearly so ..... 1. *A. dasystachyum.*
  - Plants green; leaves flat; glumes strongly pilose ..... 2. *A. yukonense.*
- Lemmas glabrous, scabrous, or short-pubescent, not densely villous.
  - Nodes appressed-pubescent; lemmas sparingly strigose-pubescent ..... 3. *A. alaskanum.*
  - Nodes glabrous; lemmas glabrous or pubescent.
    - Lemmas densely short-pubescent ..... 5a. *A. violaceum latiglume.*

Lemmas scabrous or glabrous.
- Spike relatively thick; internodes of the rachilla densely pubescent ..... 5. *A. violaceum.*
- Spike slender; internodes of the rachilla glabrous ..... 4. *A. tenerum.*

Lemmas terminating in a straight or divergent awn which equals or much exceeds the lemma in length.

Awns divergent..... 8. *A. spicatum.*

Awns straight.

A stout grass with lemmas 10 to 13 mm. long..... 7. *A. richardsonii.*

A slender grass with lemmas about 8 mm. long..... 6. *A. caninum.*

1. **Agropyron dasystachyum** (Hook.) Scribn. Bull. Torrey Club **10:** 78. 1883.

*Triticum repens dasystachyum* Hook. Fl. Bor. Amer. **2:** 254. 1840.

*Triticum dasystachyum* A. Gray, Man. 602. 1848.

A rigid, glabrous perennial 30 to 90 cm. high, with involute leaves and densely pubescent spikelets; spikes 3 to 10 cm. long; glumes lanceolate, acuminate or short-awned, 6 to 9 mm. long, glabrous or nearly so; lemmas acute or short-awned, densely pubescent; plants usually glaucous.

In the upper Yukon and reported from the Chilkat region of southeastern Alaska. It occurs in sandy soil from Saskatchewan to Wyoming and Michigan.

SPECIMEN EXAMINED: White River, Yukon Valley, *Gorman* 1151. Reported from Chilkat region by F. Kurtz.[a]

2. **Agropyron yukonense** sp. nov.

An erect, glabrous, not glaucous perennial, about 70 cm. high, with flat leaves and crowded, densely pubescent spikelets with comparatively short glumes; sheaths about equaling the internodes; ligule a narrow ring; leaf blades 10 to 20 cm. long, rather thin in texture, 3 to 6 mm. wide, flat, prominently nerved, glabrous beneath, scabrous and thinly pilose above; spikes 8 to 10 cm. long; spikelets 10 to 15 mm. long, the lower ones about equaling the nodes of the glabrous rachis, the upper ones more crowded; glumes broadly lanceolate, acute or short-acuminate, subequal, 4 to 5 mm. long, 1 to 2 mm. wide, strongly 3-nerved and pilose throughout; lemmas lanceolate, acute, about 8 mm. long, 5-nerved, densely villous throughout; palea equaling the lemma, narrow, truncate, slightly pilose and ciliate on the keels.

Type U. S. National Herbarium no. 592342, collected July, 1900, Fort Yukon, Alaska, by C. C. Georgeson (no. 22).

Related to *Agropyron dasystachyum* (Hook.) Scribn., but distinguished by its green, not glaucous, appearance, flat and rather soft, not involute, rigid, leaves, and comparatively short glumes, which are about one-half as long as the lower lemmas.

3. **Agropyron alaskanum** sp. nov.

A glabrous, erect perennial 60 to 90 cm. high, with pubescent nodes, usually flat leaves and exserted narrow spikes; culms glabrous, nodes pubescent with short appressed hairs; sheaths mostly shorter than the internodes; ligule lacerate, about 1 mm. long; leaf blades 10 to 25 cm. long, 4 to 7 mm. wide, flat or sometimes involute, scabrous on both surfaces; spikes long-exserted, 6 to 14 cm. long, rather slender; spikelets sometimes 2 at each node, 1.5 to 2 cm. long, 4 to 6-flowered, exceeding the scabrous internodes of the rachis; joints of the rachilla rather densely hispid with short stiff hairs; glumes subequal, oblanceolate, 6 to 8 mm. long, 1.5 mm. wide, abruptly obtuse or truncate, often slightly emarginate, bearing a stout awn 0.5 to 1 mm. long; lemmas 8 to 10 mm. long excluding the awn, lanceolate, hispid with short stiff hairs along the sides, especially toward the base and on the callus, otherwise glabrous; awn straight, 2 to 3 mm. long; palea equaling the lemma, truncate, ciliate on the nerves above, glabrous toward the base.

Upper Yukon.

Type U. S. National Herbarium no. 592341, collected August 18, 1899, Circle City, by W. H. Osgood.

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[a] Bot. Jahrb. Engler **19:** 424. 1894.

SPECIMENS EXAMINED: Circle City, *Osgood* in 1899; Fort Yukon, *Georgeson* 26; Lake Lindeman, *Dawson* in 1887.

In habit this species is related to *Agropyron tenerum* Vasey, but it is distinguished by its pubescent nodes, peculiarly truncate glumes, and hispid lemmas. *Agropyron parishii* Scribn. & Smith, from southern California, is the only other American species in this genus having pubescent nodes.

4. **Agropyron tenerum** Vasey, Bot. Gaz. **10:** 258. 1885. SLENDER WHEAT-GRASS.

An erect, cespitose, glabrous perennial, 60 to 90 cm. high, with narrow, flat leaves and slender spikes, 5 to 15 cm. long; glumes lanceolate; lemmas 8 to 10 mm. long, tipped with a stout, straight awn 1 to 4 mm. in length.

In dry soil, Cook Inlet and the upper Yukon, thence to California, New Mexico, and Minnesota.

SPECIMENS EXAMINED: Kenai, *Piper* 4703, 4705; opposite Port Axel (Kachemak Bay?), *Piper* 4704; it is reported [a] as collected at Dawson by R. S. Williams in 1899.

5. **Agropyron violaceum** (Hornem.) Lange, Consp. Fl. Groenland. 154. 1880.

*Triticum violaceum* Hornem. Fl. Dan. **12:** *pl. 2044*. 1832.

An erect, cespitose, glabrous perennial, with rather short, flat leaves and comparatively stout purplish spikes, 2 to 6 cm. long; glumes 8 to 12 mm. long; lemmas glabrous or nearly so, acuminate or short awn-pointed.

Usually in sandy soil, southeastern Alaska to Labrador, and southward to Colorado; also in northern Europe and Asia.

We have seen no specimens of this grass from Alaska; it is, however, reported from the Chilkat region by F. Kurtz.[b]

5a. **Agropyron violaceum andinum** Scribn. & Smith, U. S. Dept. Agr. Div. Agrost. Bull. **4:** 30. 1897.

A low form differing from the species by its somewhat decumbent habit, shorter spikes, and awned lemmas, the awn equaling or exceeding the lemma.

Southeastern Alaska, southward to the high mountains of Colorado.

SPECIMEN EXAMINED: Lake Lindeman, *Dawson* 88, in part.

5b. **Agropyron violaceum latiglume** Scribn. & Smith, U. S. Dept. Agr. Div. Agrost. Bull. **4:** 30. 1897.

A low form, 10 to 15 cm. high, with thicker spikes and broader, pubescent lemmas and often pubescent leaves.

Yakutat Bay and southeastern Alaska, south to Montana and Labrador; also in Grinnell Land.

SPECIMENS EXAMINED: Lake Lindeman, *Dawson* 86; Hidden Glacier, Yakutat Bay, *Coville & Kearney* 971, 983a.

6. **Agropyron caninum** (L.) Beauv. Ess. Agrost. 102. 1812.

*Triticum caninum* L. Sp. Pl. 86. 1753.

*Elymus caninus* L. Fl. Suec. ed. 2. 112. 1755.

An erect, glabrous perennial, 30 to 90 cm. high, with flat leaves and awned spikelets; spikes 7 to 20 cm. long, glumes about 10 mm. long, tapering into an awn usually 2 to 6 mm. long; lemmas about 8 mm. long, acuminate into an awn 1 to 2 cm. in length.

In waste grounds in the upper Yukon valley, east to New Brunswick and south to Colorado and Tennessee; also in Europe and Asia.

SPECIMEN EXAMINED: Fort Yukon, *Bates* in 1889.

7. **Agropyron richardsonii** Schrad. in Trin. Linnaea **12:** 467. 1838.

*Triticum richardsonii* Trin. loc. cit.

*Agropyron unilaterale* Cassidy, Bull. Colo. Exp. Sta. **12:** 63. 1890, not Beauv. 1812.

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[a] Nash, Bull. N. Y. Bot. Gard. **2:** 158. 1901.

[b] Bot. Jahrb. Engler **19:** 424. 1894.

*Agropyron violacescens* Beal, Grasses N. Amer. **2:** 635. 1896.

A rather stout, smooth perennial, 60 to 80 cm. high, with rough, involute-pointed leaves and erect, usually one-sided, bearded spikes 7 to 10 cm. long; glumes exceeding the florets, 12 to 16 mm. long; lemmas 10 to 13 mm. long, with a scabrous awn about 2.5 cm. in length.

The Upper Yukon, and southward to Colorado, Nebraska, and Minnesota.

SPECIMEN EXAMINED: Dawson, *Williams* in 1899.

8. **Agropyron spicatum** (Pursh) Rydb. Mem. N. Y. Bot. Gard. **1:** 61. 1900.

*Festuca spicata* Pursh, Fl. Amer. Sept. **1:** 83. 1814.

*Agropyron divergens* Nees in Steud. Syn. Pl. Glum. **1:** 347. 1854.

A rigid wiry, cespitose, glabrous perennial, 30 to 90 cm. high, with narrow, flat or involute leaves and erect spikes; glumes acute, about one-half as long as the spikelet; lemmas terminating in a stout, scabrous divergent awn 1 to 2.5 cm. long.

Dry rocky soils and bench lands, Washington and Montana to Colorado; reported from Alaska.

We have seen no specimens of this grass from Alaska. It is, however, reported from there by F. Kurtz [a] from dry hills, Kloquan (444a).

8a. **Agropyron spicatum tenuispicum** (Scribn. & Smith) Rydb. Mem. N. Y. Bot. Gard. **1:** 61. 1900.

*Agropyron divergens tenuispicum* Scribn. & Smith, U. S. Dept. Agr. Div. Agrost. Bull. **4:** 27. 1897.

A slender form with flexuous spikes 8 to 15 cm. long, smaller spikelets, and shorter awns than in the species.

Range of the species.

We have seen no specimens of this grass from Alaska. It is, however, reported [b] as collected at Dawson by R. S. Williams in 1899.

AGROPYRON REPENS (L.) Beauv. is reported from Kotzebue Sound (*Turner* 1886) and from Eschscholtz Bay, [c] but it is certain that this species does not extend to Alaska, the plants so referred being doubtless forms of *Agropyron violaceum* (Hornem). Lange.

## 26. HORDEUM L.

*Hordeum* L. Sp. Pl. 84. 1753.

Spikelets 1-flowered, 2 or 3 at each joint of the articulate rachis, sessile or on very short pedicels; rachilla articulated above the glumes and continued behind the palea of the central spikelet into a naked bristle; glumes 2, subulate, setaceous, rigid; lemmas lanceolate, rounded on the back, usually awned. Annual or perennial grasses with terminal cylindrical spikes and awned spikelets.

Glumes 4 to 7 cm. long ..... 1. *H. jubatum.*
Glumes 2 cm. long or less.
  Leaf blades 4 to 8 mm. wide; spike rather stout, lateral spikelets strongly developed ..... 2. *H. boreale.*
  Leaf blades 3 mm. wide or less; spike slender, lateral spikelets but slightly developed ..... 3. *H. nodosum.*

1. **Hordeum jubatum** L. Sp. Pl. 85. 1753. SQUIRREL-TAIL GRASS.

A smooth, slender, cespitose, erect perennial, 20 to 60 cm. high, with flat leaves and long-bearded, nodding spikes, 5 to 10 cm. long, the awns 4 to 7 cm. in length.

In moist, usually saline soil, in the upper Yukon, east to Newfoundland, south to Colorado and California.

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[a] Bot. Jahrb. Engler **19:** 424. 1894.

[b] Nash, Bull. N. Y. Bot. Gard. **2:** 158. 1901.

[c] Ledeb. Fl. Ross. **4:** 340. 1854.

SPECIMENS EXAMINED: Ranch Valley (Upper Yukon Valley), *Gorman* 1079; Fort Yukon, *Bates* in 1889, *Georgeson* 23.

2. **Hordeum boreale** Scribn. & Smith, U. S. Dept. Agr. Div. Agrost. Bull. **4:** 24. 1897. NORTHERN WILD BARLEY.

A slender, erect perennial with rather broad flat leaves, smooth culms, and erect, terminal spikes 5 to 10 cm. long; leaf blades 4 to 8 mm. wide; glumes setaceous and awn-like, 2 cm. long or less; lateral florets staminate or neuter. Closely related to *Hordeum nodosum* L.

Aleutian Islands and Alaska Peninsula to the southeastern boundary, thence southward to California; also in the Commander Islands.

This species is the *Hordeum pratense* and *H. secalinum* of the various published lists of Alaskan grasses.

3. **Hordeum nodosum** L. Sp. Pl. ed. 2. 126. 1762. MEADOW BARLEY.

A species closely related to the last, differing in its more slender habit, narrower leaves (about 3 mm. wide) more slender spikes, and less developed lateral spikelets.

Kodiak Island to southeastern Alaska, California, Texas, and Mississippi; also in Europe and Asia.

SPECIMENS EXAMINED: Foggy Bay, near Cape Fox, *Coville & Kearney* 2565; Kodiak, *Piper* 4656.

## 27. ELYMUS L.

*Elymus* L. Sp. Pl. 83. 1753.

Spikelets 2 to 6-flowered, sessile in pairs at the nodes of the continuous or articulate rachis; rachilla articulated above the glumes and between the florets; glumes 2, subequal, rigid, narrow, 1 to 3-nerved; the lemmas shorter than the glumes, rounded on the back, obscurely 5-nerved, acute or awned from the apex. Erect grasses with flat leaves and densely flowered terminal spikes.

Mostly slender plants; lemmas glabrous or nearly so (ciliate on the margins in *E. borealis*).
- Lemmas awnless or nearly so ..... 1. *E. howellii.*
- Lemmas long-awned.
  - Lemmas glabrous or scabrous ..... 2. *E. glaucus maximus.*
  - Lemmas prominently ciliate on the margins ..... 3. *E. borealis.*

Mostly stout plants; lemmas villous or pubescent throughout.
- Glumes subulate ..... 4. *E. innovatus.*
- Glumes lanceolate.
  - Spike less than 8 cm. in length ..... 5. *E. villosissimus.*
  - Spike exceeding 10 cm. in length ..... 6. *E. mollis.*

1. **Elymus howellii** sp. nov.

A rather slender, glabrous perennial 90 to 120 cm. high, with flat, lanceolate leaves, exserted spikes, and awnless spikelets; culms geniculate below, the nodes, at least the upper ones, appressed-pubescent; sheaths shorter than the internodes; ligule hyaline, truncate, about 2 mm. long; leaf blades 15 to 25 cm. long, 8 to 12 mm. wide, acuminate, scabrous above, glabrous beneath; spike 8 to 10 cm. long, 1 cm. or less in diameter, densely flowered, the rachis prominently scabrous on the margins; spikelets in pairs, about 1.5 cm. long; glumes subequal, lanceolate, acuminate, equaling the spikelet, 1 to 2 mm. wide, strongly nerved, scabrous; first lemma 12 to 14 mm. long, lanceolate, acuminate, and sometimes bearing an awn 1 mm. long, glabrous or slightly scabrous above, ciliate-scabrous on the margins; palea somewhat shorter than the lemma, ciliate-scabrous on the nerves.

Type U. S. National Herbarium no. 592340, collected August 14, 1895, Revillagigedo Island by Thomas Howell (no. 1723) and distributed as "*Elymus dahuricus* Turcz.(?)"

SPECIMENS EXAMINED: Revillagigedo Island, *Howell* 1723; Juneau, *Coville & Kearney* 2491, *Cole* in 1899.

This species is related to *Elymus virescens* Piper, but is distinguished by its much larger size, larger spikelets, and usually pubescent nodes.

2. **Elymus glaucus maximus** Davy in Jepson, Fl. Mid. West. Calif. 79. 1901.

*Elymus americanus* Vasey & Scribn.; Macoun, Cat. Can. Pl. **4:** 245. 1888, nom. nud.

A rather stout glabrous perennial, 90 to 150 cm. high, with broad, lanceolate leaves, densely flowered spikes about 15 cm. long, and long-awned spikelets; lemmas glabrous or scabrous, bearing a terminal awn, 1 to 2 cm. in length.

In dry or damp, usually shady soils, southeastern Alaska, southward to California.

SPECIMEN EXAMINED: Sitka, *Wright* 1587.

There is in the U. S. National Herbarium a fragmentary specimen from Fort Yukon, collected by O. S. Bates in 1889, that is apparently undescribed, differing from the above in its subulate glumes and strigose-pubescent lemmas, in this latter respect approaching *Elymus sibiricus* L. It is most closely related to *Elymus macounii* Vasey.

3. **Elymus borealis** Scribn. U. S. Dept. Agr. Div. Agrost. Circ. **27:** 9. 1900.

ALASKAN RYEGRASS.

*Elymus ciliatus* Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **11:** 57. *pl. 16.* 1898, not Muhl. 1817.

A rather slender, erect perennial about 70 cm. high, with soft, flat leaves and slender, nodding spikes 7 to 12 cm. long; spikelets 1.5 cm. long; lemmas about 1 cm. long, ciliate-pubescent along the margins, especially near the apex, bearing a nearly straight awn 2 to 2.5 cm. long.

In damp soil, Yakutat Bay, southward to the Olympic Mountains, Washington.

SPECIMENS EXAMINED: Sitka, *Evans* 210 (type), 798; Juneau, *Cole* in 1899, *Coville & Kearney* 2475, *Piper* 4661; Yes Bay, Behm Canal, *Howell* 1724; Yakutat, *Piper* 4662.

A peculiar species, at once recognized by its ciliate lemmas. It is related to *Elymus sibiricus* L., to which Trinius[a] referred it. Most if not all of the material in Alaskan collections named *Elymus sibiricus* should be referred to *E. borealis*.

4. **Elymus innovatus** Beal, Grasses N. Amer. **2**: 650. 1896.

*Elymus mollis* R. Br. in Richards. Bot. App. Frankl. Journ. 732. 1823, not Trin. 1821.

*Elymus brownei* Scribn. & Smith, U. S. Dept. Agr. Div. Agrost. Bull. **8:** 7. *pl. 4.* 1897.

A rigid, rather slender, erect perennial, 50 to 90 cm. high, with numerous basal leaves, short cauline leaves and densely flowered, pubescent spikes 4 to 10 cm. long; glumes short, subulate; lemmas densely pubescent, short awn-pointed.

Gravelly or sandy banks, arctic Alaska, southward in the interior to Wyoming and South Dakota.

SPECIMENS EXAMINED: Chandlar (Gens de Large) River, Camp 6, *Schrader* in 1899; Cape Smythe, *Schrader* in 1901.

5. **Elymus villosissimus** Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **11:** 56. 1898.

A stout, erect perennial, 30 to 40 cm. high, from a strong creeping rootstock, with rather broad, flat leaves and short, densely flowered spikes, 5 to 8 cm. long; spikelets 3 to 5-flowered, with densely villous lemmas, the narrowly lanceolate and subulate-pointed glumes nearly equaling the spikelet.

Aleutian and Pribilof islands.

SPECIMENS EXAMINED: Wrangell Island, *Hooper* in 1881; St. Paul Island, *Macoun* 16226.

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[a] In Bong. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **2:** 174. 1832.

6. **Elymus mollis** Trin. in Spreng. Neu. Entd. **2:** 72. 1821.

*Elymus dives* Presl, Rel. Haenk. **1:** 265. 1830.

*Elymus capitatus* Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **11:** 55. *pl. 14.* 1898.

A stout, erect, glabrous perennial, 60 to 150 cm. high, with lanceolate, firm leaves, and dense spikes of strongly villous spikelets; leaf blades lanceolate, glabrous below, scabrous above; spike 10 to 18 cm. long, about 2 cm. in diameter; spikelets 1.5 to 2 cm. long; glumes lanceolate, villous; lemmas lanceolate, acute, densely villous.

The common grass in sands along the coast from Seward Peninsula southward to Oregon, also on the Aleutian and Pribilof islands, and in Siberia.

SPECIMENS EXAMINED: Atka Island, *Turner* 1191; Dyea, *Canby* 371; Muir Glacier, *Golder* 5; Glacier Bay, Point Gustavus, *Coville & Kearney* 762; Kodiak, *Brewer & Coe* 211, *Kellogg* 140; near Port Clarence, *Walpole* 1635, 1689, 1794; Kasilof, *Evans* 699; Cape Nome, *Flett* 1687, *Blaisdell* in 1900; Sitka, *Wright* 1594, *Piper* 4661; Nushagak, *McKay* in 1881; St. Paul Island, *Macoun* in 1896, 16627, *Merriam* in 1891, *Trelease & Saunders* 2917; Homer, *Evans* 471; Kruzgamepa River, *Collier* in 1900; Tatitlek, *Evans* 284; Tatoosh Islands, *Flett* 2011; Unalaska, *Harrington* in 1871–72, *Coville & Kearney* 1722, 2187, *Kellogg* in 1867; Prince William Sound Virgin Bay, *Trelease & Saunders* 2619, *Coville & Kearney* 1215; Wrangell, *Evans* 42; Yakutat Bay, *Coville & Kearney* 1125, *Funston* 140; Yes Bay, Behm Canal, *Howell* 1725.

## EXCLUDED SPECIES.

GRAPHEPHORUM MELICOIDEUM MAJOR A. Gray.

Reported from Portage Bay by Kurtz,[a] but certainly on a misconception of the species and genus, as that species is not found west of the Great Lakes.

AVENA SATIVA L.

This cultivated species is reported [b] as collected at Dawson by R. S. Williams, but it is only an escape from cultivation and should not be considered as a part of the Alaskan flora.

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[a] Bot. Jahrb. Engler **19:** 422. 1894.

[b] Nash, Bull. N. Y. Bot. Gard. **2:** 156. 1901.

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Includes descriptions of five new species and three new varieties from Sitka and lists twenty-three other grasses from the same locality. The grasses in this work were described by C. B. Trinius.

**Britton,** N. L., and Rydberg, P. A. An Enumeration of the Flowering Plants Collected by R. S. Williams and J. B. Tarleton. Bull. N. Y. Bot. Gard. **2:** 150–158. 1901.

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**Cooley,** Grace E. Plants collected in Alaska and Nanaimo, B. C., July and August, 1891. Bull. Torrey Club **19:** 246. 1892.

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**Coville,** Frederick V. Botany of Yakutat Bay, Alaska. Contr. Nat. Herb. **3:** 348. 1896.

Lists ten species of grasses which were determined by Dr. George Vasey.

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**Grisebach,** H. R. A. See Ledebour, Flora Rossica.

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**Knowlton,** F. H. List of plants collected by Mr. Charles L. McKay at Nushagak, Alaska, in 1881, for the United States National Museum. Proc. U. S. Nat. Mus. **8:** 220. 1885.

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——— Alaskan Plants. Bot. Gaz. **11:** 340. 1886.

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**Kurtz,** F. Die Flora des Chilcatgebietes im südöstlichen Alaska. Bot. Jahrb. Engler **19:** 419–424. 1895.

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**Ledebour,** C. F. V. Flora Rossica **4:** 324–466. 1853. Grasses by H. R. A. Grisebach.

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Lists ten species of grasses which were determined by Dr. George Vasey.

**Muir,** John. Botanical notes on Alaska in cruise of the revenue steamer Corwin in Alaska and the N. W. Arctic Ocean in 1881. 47th Cong. 2nd sess. House Ex. Doc. **105:** 51–53. 1883.

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**Nash,** G. V. See Britton, N. L., and Rydberg, P. A.

**Nordenskiold,** A. E. Vega-Expeditionens Vetenskapliga Iakttagelser bearbetade af deltagare I resan och andra forskare utgifna af A. E. Nordenskiold **2:** 21–22, 54–56. 1883. Botany by F. R. Kjellman.

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**Presl,** J. S. and C. B. Reliquiae Haenkeanae, seu descriptiones et icones plantarum, quas in America meridionali et boreali, in insulis Philippinis et Marianis collegit Thaddaeus Haenke **1:** 207–349, 1830.

Describes thirteen species of grasses from Nootka Sound, Vancouver Island.

**Ray,** P. H. Report on the International Polar Expedition to Point Barrow, Alaska. 48th Cong. 2nd sess. House Ex. Doc. 44, Part VIII. Plants, p. 191–192. 1885.

Lists eight species of grasses determined by Dr. Asa Gray.

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Refers to six species of Alaskan grasses described by Presl from Nootka Sound.

**Seemann,** B. Botany of the Voyage of H. M. S. Herald, p. 43–44. 1852–57.

Lists twenty species of grasses from western Iskimaux-Land.

**Trinius,** C. B. Graminum genera quædam speciesque complures definitionibus novis. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **1:** 54–93. 1830.

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**Turner,** L. M. Contributions to the Natural History of Alaska. 49th Cong. 1st sess. Senate Misc. Doc. **155:** Part III. Plants. 79–81. 1886.

Includes a list of fifty-six species of grasses.

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# CONTRIBUTIONS

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# UNITED STATES NATIONAL HERBARIUM

VOLUME 13, PART 4

# NEW OR NOTEWORTHY PLANTS FROM COLOMBIA AND CENTRAL AMERICA—2

By HENRY PITTIER




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# PREFACE.

This paper is the second number of the series, by Henry Pittier, entitled New and Noteworthy Plants from Colombia and Central America, the first having been published in Volume 12 of the Contributions from the United States National Herbarium, pages 171 to 181. It consists chiefly of descriptions of new and little known species of Asclepiadaceae and Cucurbitaceae, keys to the species of several genera, and the characterization of two new genera, Frantzia and Polakowskia, from Costa Rica.

FREDERICK V. COVILLE,
*Curator of the United States National Herbarium.*

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# NEW OR NOTEWORTHY PLANTS FROM COLOMBIA AND CENTRAL AMERICA—2.

By Henry Pittier.

## MAGNOLIACEAE.

### THE COSTA RICAN SPECIES OF TALAUMA.

The genus Talauma is represented in Costa Rica by two species, one of which grows at the lower edge of the "tierra templada," while the other is conspicuous among the larger trees of the upper forest belt on the volcanoes Barba and Poás. Heretofore the last species has been considered identical with *T. cespedesii* of Central Colombia, a view that is not tenable, for reasons which are stated below.

**Talauma poasana** Pittier, sp. nov.

Medium-sized tree. Young twigs glabrous, regularly marked by the circular scars of the caducous stipules.

Leaves coriaceous, glabrous, petiolate. Petioles 3 to 3.5 cm. long, canaliculate, rather slender. Leaf blades 10 to 14 cm. long, 5 to 6 cm. broad, acute at base, with a more or less rounded acumen, light green and glossy above, whitish green and finely reticulate beneath. Margin very entire, slightly revolute.

Pedicels 6 cm. long from bract to perianth. Perianth formed of 9 thick, coriaceous divisions, the 3 exterior ones (sepals) larger, about 6 cm. long by 2 cm. broad, elliptic-ovate, greenish and callose on the back, cream white with purplish tinges inside, the interior ones obovate-spathulate and conchiform, of the same length as the former but narrower and entirely cream white. Stamens numerous; anthers sessile, about 12 mm. long, introrse. Carpels numerous, fusiform, and forming a strobiliform gynœcium. Ovary 2-ovulate; style dorsi-sulcate, ending in an obtuse reflexed tip.

Fruits and seeds unknown.

Costa Rica: Rancho Flores, altitude 2,050 meters, at the foot of the Barba Volcano, *Pittier*, flowers, May, 1888; *Tonduz*, flowers, February, 1890 (Instituto fís-geog. Costa Rica nos. 269, 2144); El Achiote, Poás Volcano, 2,240 meters, *Pittier*, flowers, July, 1888 (Instituto fís-geog. Costa Rica no. 328); La Quesera, Poás Volcano, 2,300 meters, *Pittier* 2043, March 31, 1907 (U. S. National Herbarium no. 578441, type).

Mr. Donnell Smith considers this species the same as *Talauma cespedesii* Triana & Planch., a large tree reported from the Colombian province of Bogotá. Of the latter, there are no specimens extant in any collection, and the authors based their incomplete diagnosis on Doctor Cespedes's original and probably untechnical description published about 1840, in Bogotá, on a loose sheet, in which the plant received the generic name of Santanderia, from one of the protagonists of the great South American Revolution. The few characters given in Triana and Planchon's Memoir, then, are not at all reliable and, moreover, they agree very imperfectly with the above description of the Costa Rican specimens. For these reasons I prefer to give a new name to our species and to leave it for future explorers to find again Cespedes's tree, so

as to make possible a new and complete description, that will confirm one or other of the opposed opinions entertained by my excellent friend Capt. Donnell Smith and myself.

**Talauma gloriensis** Pittier, sp. nov.

A middle-sized forest tree.

Leaves very variable in size, coriaceous, entire, glabrous. Petioles 2 to 4 cm. long, rounded beneath, flattened above and bordered by 2 whitish, callose lines, closing together at the blade. Leaf blades more or less broadly elliptic-lanceolate, briefly attenuate at base, acute or rounded at tip, 10 to 25 cm. long, 4 to 10 cm. broad, paler beneath, the elegantly reticulate venation prominent on both sides. Stipules deciduous, about 2.5 cm. long, papillose and dark brown on the outer side, smooth inside, with a 3-fid end, the middle tip being longer, somewhat foliaceous, and subulate. Buds 4 cm. long, 3 cm. in diameter. Bracts 2, deciduous. Perianth formed of 9 coriaceous, greenish-white, thick divisions, the 3 exterior (sepals) ovate, short-acuminate, 4 cm. long, 3 cm. broad, the 6 interior (petals) ovate-elliptic, slightly narrower and attenuate at base. Stamens numerous; anthers almost sessile, linear, introrse. Carpels 30 to 36. Styles deciduous.

Fruit 4 to 5 cm. long, 3 to 3.5 cm. in diameter, the lignified, scale-like carpels measuring about 2 cm. in length and 7 to 8 mm. in breadth. Dehiscence irregular.

Costa Rica: Reventazon Valley, shade tree in the coffee plantations at La Gloria, *Pittier*, flowers, January, 1902 (Instituto fís-geog. Costa Rica no. 16362; U. S. National Herbarium no. 579341, type); *Cook & Doyle* 390, flowers, April 26, 1902 (U. S. National Herbarium no. 474215); El Guayabo, altitude 1,000 meters, *Ridgway* 1908 (U. S. National Herbarium no. 579416).

## EUPHORBIACEAE.

### CORRECTIONS AND ADDENDA TO "THE MEXICAN AND CENTRAL AMERICAN SPECIES OF SAPIUM."[a]

In a very important, recently published[b] contribution to the knowledge of the genus Sapium, Mr. Hemsley introduced some changes affecting my own results as published in the Contributions. While my *S. sulciferum* is recognized as a good species, and is redescribed and excellently illustrated, *S. pleiostachys* Schum. & Pittier and *S. anadenum* Pittier are identified with each other and relegated to the synonymy of *S. jamaicense* Sw. With reference to the latter three forms, I regret to be unable to agree with the eminent botanist of Kew, even after a careful reexamination of the specimens. But at the same time, it is only fair to acknowledge that his adverse stand as to my new creations is partly justified by my own mistake in including Mr. Donnell Smith's specimen no. 2607, from Guatemala, as one of the types of *S. pleiostachys*, from which the characters of the capsule were drawn. As a matter of fact, our imperfect specimen of the Guatemalan plant compares satisfactorily with Wright's no. 578 from Cuba, and is doubtless *S. jamaicense* Sw., as stated by Mr. Hemsley.

Although it would have been desirable to obtain more complete data before giving a definite statement as to the real standing of the

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[a] Contr. Nat. Herb. **12:** 159–169. 1908.

[b] Hook. Icon. Pl. *pl. 2876–2900*. 1909.

two questioned species, I should be willing to abide by Mr. Hemsley's opinion in this particular and to consider *S. anadenum* a synonym of *S. pleiostachys*, but for the following considerations. In the first species the leaves are proportionately shorter and broader; the primary veins are more distant and the venation in general is more conspicuous on the lower face of the blades; the petiolar glands are almost always undeveloped; the petioles are broad with their margins turned up so as to form a deep channel on the upper side of the same, while in *S. pleiostachys* they are scarcely sulcate, a differential character that escaped my notice at first. Furthermore, after a new and careful investigation of the flowers, I have to confirm every detail in the descriptions given, and it will not weaken the case to add that while the last-named form grows almost at sea level on the semiarid coast of the Pacific, *S. anadenum* is a mountain tree, the specimens of which were collected in the damp forests (Regenwälder) of the Reventazon basin.

In a letter dated March 5, 1910, Mr. Hemsley says in part:

> Mr. Tonduz has sent to Kew a small piece of "*Sapium anadenum*," and I now think it may be specifically distinct from *S. jamaicense*, but the material is insufficient for me to form a definite opinion.

I am confident that a further examination of complete specimens, which are unfortunately not available at present, would not only dispel all doubt of the specific value of *S. anadenum*, but would also satisfy as to the distinctive merits of *S. pleiostachys*. The difference between *S. jamaicense* and *S. pleiostachys* can be seen at a glance, even by one who is not an expert in descriptive botany. *S. pleiostachys* has very slender petioles and small, shiny leaf blades, and the midrib forms on the upper face a linear furrow (instead of a broad one as in the West Indian species). Setting aside the Guatemalan specimen, we find that the margin of the leaves is always entire or at the most obscurely sinuate; the primary veins are closer, more numerous, and less apparent. The floral spikes are mostly in clusters of 4, and there are from 6 to 8 flowers (and not 3) with each bract. As stated above, the description of the capsules should be eliminated, since the ones at hand were those of Donnell Smith no. 2607, wrongly included in the species by myself.

Only the following changes, then, need to be introduced into the nomenclature of Sapium within the scope of my former paper:

**Sapium jamaicense** Sw. Adnot. Bot. 62. 1829.
Donnell Smith no. 2607. Capsules and leaves only.

**Sapium ruizii** Hemsl. Hook. Icon. *pl. 2894*. 1909.
Mexico or Central America (Ruiz & Pavon).

**Sapium simile** Hemsl. loc. cit. (text).
Central America (Ruiz & Pavon).

**Sapium macrocarpum** Mueller Arg. Linnaea **32**: 119. 1863.
*S. mexicanum* Hemsl. Hook. Icon. *pl. 2680*. 1901.

## ASCLEPIADACEAE.

### NEW OR INTERESTING SPECIES.

The study of these few species has brought to light the urgent necessity of a thorough revision of the representatives of the order in Central America.

**Philibertia reflexa** Pittier, sp. nov. FIGURE 2.

A vine, almost entirely glabrous, with rounded, slender stems.

Leaves coriaceous, easily caducous. Petioles 10 to 14 mm. long, slender, sulcate. Leaf blades 3 to 5 cm. long, ovate, cordate, acutely long-acuminate, entirely smooth, deep green above, paler beneath.

Inflorescences cymose, pedunculate, umbel-like, bearing 30 flowers, often more. Peduncles 2 to 3 cm. long. Pedicels 2.5 to 3 cm. long, very slender, provided at the base with a common involucre of narrowly lanceolate, acute bracts, 5 to 10 mm. long. Lobes of calyx ovate, obtuse, 3 to 4 mm. long, 1.5 mm. broad, sparsely ciliate. Corolla

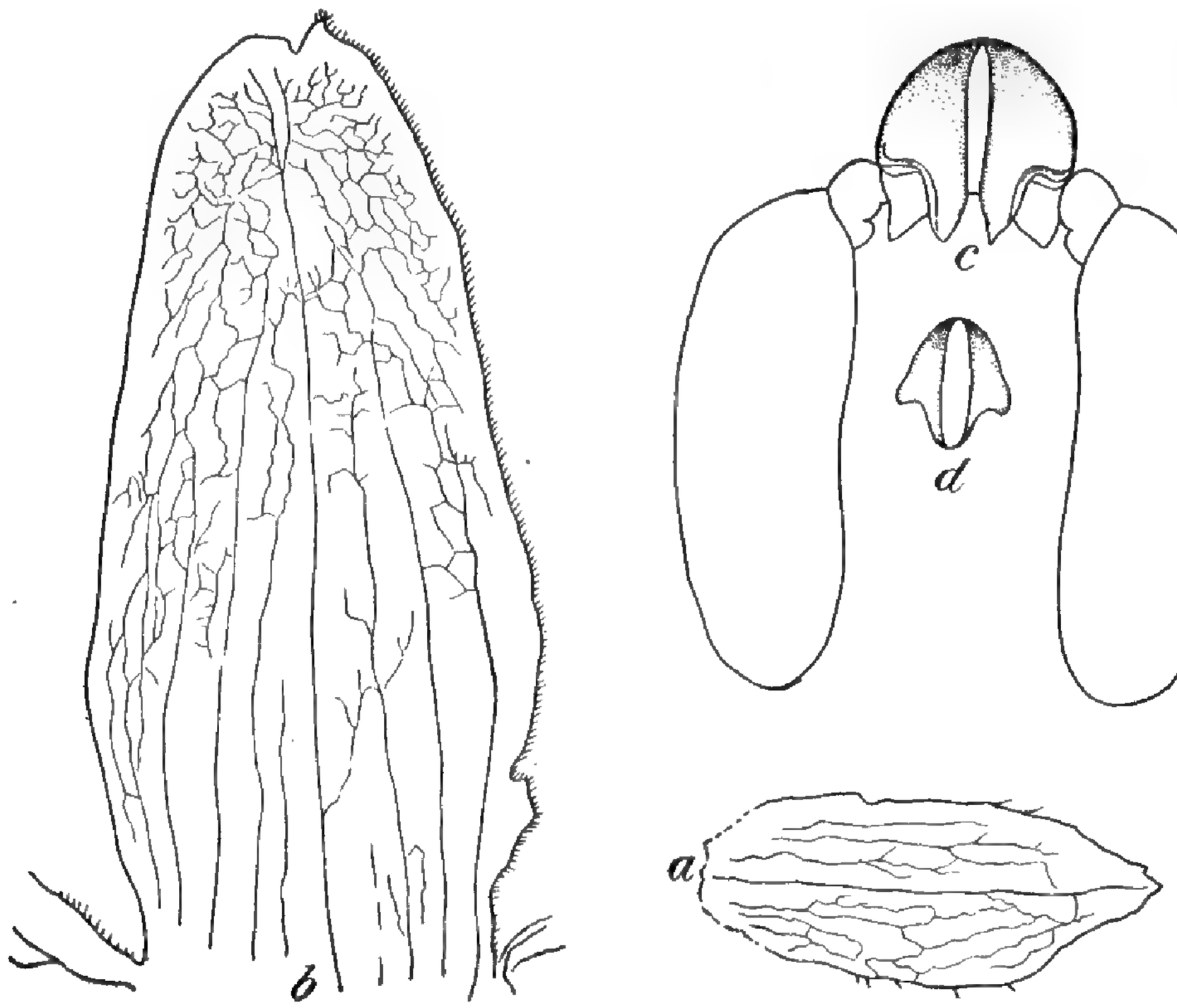



FIG. 2.—Flower parts of *Philibertia reflexa* and *P. odorata*. Of former, *a*, segment of calyx; *b*, lobe of corolla; *c*, translatorium. Of latter, *d*, retinacle. *a*, *b*, Scale 9; *c*, *d*, scale 32.

rotate, deeply incised, about 2 cm. in diameter; tube very short, slightly hairy inside; lobes oblong-lanceolate, rounded at tip, 7 to 8 mm. long, 3 to 4 mm. broad, ciliate on the right margin, all reflexed at anthesis. Outer corona annular, smooth, rather thin; scales of inner corona swollen, longer than the anthers. Retinacle broad, more or less heartshaped, 0.5 mm. long and broad; arms short (0.2 mm.); pollinia oblong, subcylindrical, 1.16 mm. long, 0.42 mm. in diameter. Ovary glabrous; stigma slightly bifid. Follicles not known.

COSTA RICA: On bushes around Nicoya, *Pittier*, flowers, December, 1903 (U. S. National Herbarium no. 578558, type).

This species belongs to the same group (Cordatae) with *P. odorata* Hemsl., *P. pavoni* Hemsl., and a few others. Its nearest affinity appears to be with *P. odorata*, from which it differs by its being almost entirely glabrous, and by its larger flowers and translators. The reflexed position of the lobes of the corolla at the time of the anthesis seems to be also a good, constant character.

**Fischeria calycina** Decaisne in DC. Prodr. **8**: 600. 1844. FIGURE 3.

A milky vine. Stems and branchlets velvety-pubescent, and covered at the same time with somewhat sparse, long, stiff, brownish hairs.

Leaves petiolate, of a medium size. Petioles 4 to 5 cm. long, slender, pubescent, and with interspersed long hairs. Leaf blades 7 to 14 cm. long, 4 to 7 cm. broad, ovate, often contracted near the base, cordate, acuminate; upper face dark green and sparsely short-hairy; lower face velvety, pale, with the main nerves and veins forming a brown-colored salient, reticulate design.

Inflorescences axillary and racemose; flowers caducous. Peduncles 12 to 20 cm. long, i. e., as long as the adjacent leaves, pubescent, with interspersed long stiff hairs, the upper part covered with the scars of the fallen flowers. Pedicels 2.4 cm. long, slender, velvety like the branches, provided at the base with an acute, linear, hairy bracteole. Lobes of calyx 4 to 5 mm. long, 1.8 to 2 mm. broad, lanceolate, subacute, hirsute, alternating with finger-like glands. Corolla yellowish white, its lobes about 10 mm. long, 5 mm. broad, suddenly contracted and with plicate margin near the subacute end. Crown double, the exterior annular, the interior lobulate and adhering to the anthers. Retinacle subhastate, contracted at the base, 0.29 mm. long, 0.25 mm. in maximal breadth; caudicles about 0.15 mm. long; pollinia subreniform, 0.97 mm. long, the maximum transverse diameter 0.60 mm. Ovaries ovate, hairy, ending in an obtuse, glabrous style about 1 mm. long. Follicles not known.

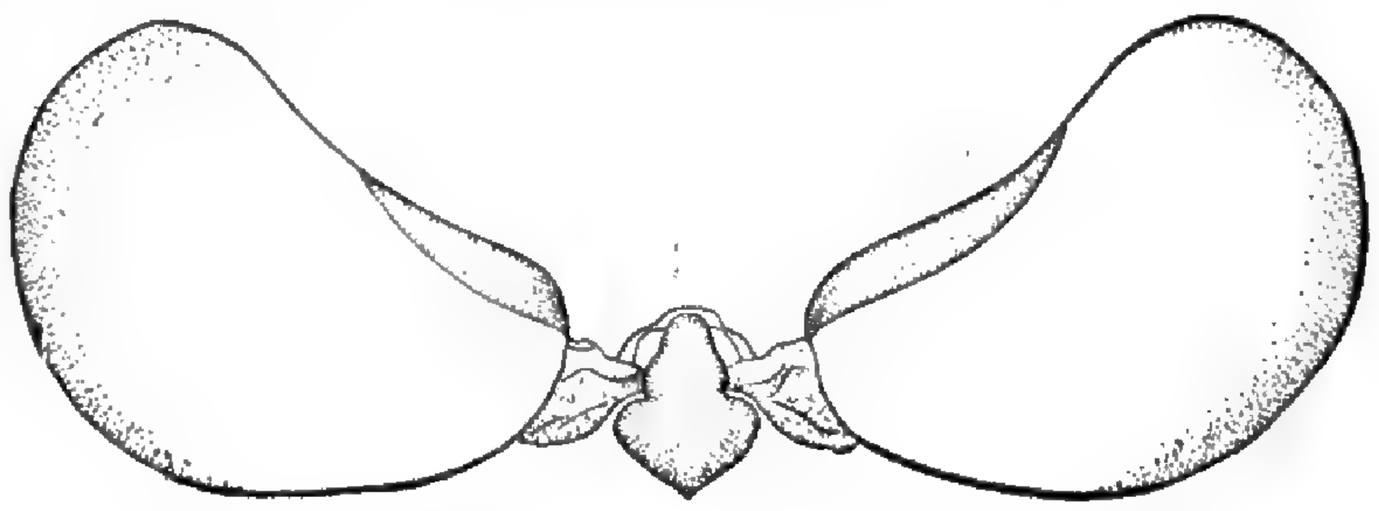


FIG. 3.—Translatorium of *Fischeria calycina*. Scale 32.

COLOMBIA: Córdoba, at the outlet of the Dagua Valley, Pacific coastal zone, altitude 30 to 100 meters, *Pittier* 596, flowers, December 9, 1905 (U. S. National Herbarium no. 530783).

The identification of the species of this genus is extremely difficult and the group needs a thorough revision. Our Colombian specimens, as here described, agree better with Decaisne's description of *Fischeria calycina* than with that of any other of the West Andean forms.

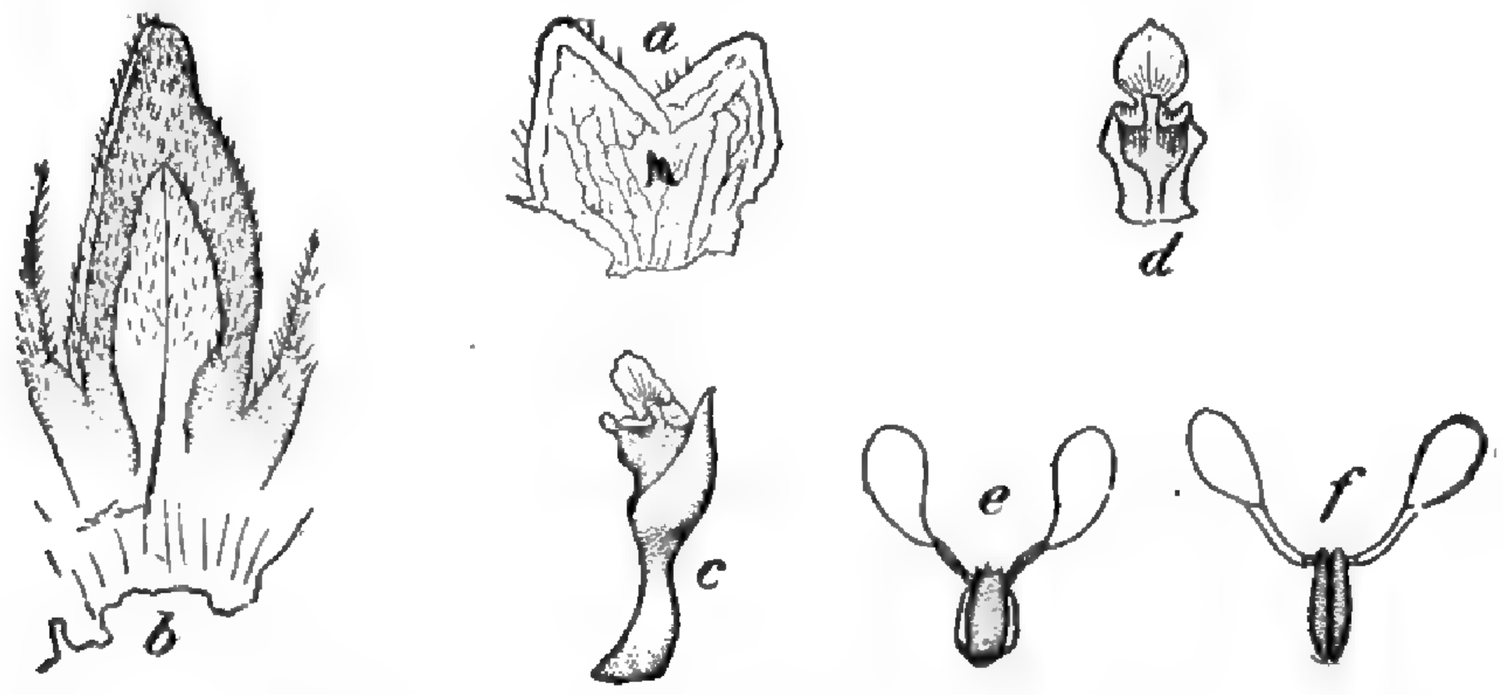



FIG. 4.—Flower parts of *Metastelma decipiens* and *M. barbigerum*. Of former, *a*, part of calyx; *b*, lobule of corolla; *c*, stamen, lateral view, showing scale of corona; *d*, anther, front view, showing apical appendage; *e*, translatorium. Of latter, *f*, translatorium. *a*–*d*, Scale 9; *e*, *f*, scale 32.

**Metastelma decipiens** Pittier, sp. nov. FIGURE 4.

Subvoluble, trailing vine, the stems rather thick, divaricate, longitudinally striate, minutely pubescent. Fully developed internodes 6 cm. long.

Leaves rather large or middle-sized. Petioles about 5 mm. long, pubescent. Leaf blades 3 to 4 cm. long, 1 to 1.5 cm. broad, lanceolate, acuminate, rounded at base, glabrous or sparsely pubescent, blackish above and yellowish green below when dry, with one pair of conical glands near the insertion of the petiole; margin more or less revolute.

Cymes axillary or terminal, often compound, pedunculate, always shorter than the leaf; flowers numerous on each cyme, rather large. Peduncles thick and stiff, 5 to 15 mm. long, pubescent. Pedicels 3 to 4 mm. long, also minutely hairy. Calyx hairy outside, about 1.6 mm. long; lobules rounded-triangular, with a scariose, ciliate margin. Corolla 3 to 3.5 mm. long, tubulose-campanulate, deeply parted, white inside, brownish outside; lobes lanceolate, 2.5 to 3 mm. long, acute, very hairy inside on the margin and tip, the center glabrous. Corona inserted near the middle of the stamens, the scales about 1 mm. long, 0.4 mm. broad at base, membranous, acutely triangular, not surpassing the tips of the apical membranes of the anthers. Stamens 2.2 mm. long, the apical membrane acutely ovate (0.55 mm. long, 0.45 mm. broad). Retinaculum short and broad (about 0.18 mm. long, 0.10 mm. broad), with thin, wing-like, transparent margins. Caudicles slender, 0.15 mm. long. Pollinia pendent, pear-shaped, 0.18 to 0.22 mm. long. Pistil smooth; styles about 1.2 mm. long.

Follicles not seen.

GUATEMALA: San Miguel Uspantán, Department of Quiché, at an altitude of about 2,000 meters, *Heyde & Lux*, flowers, April, 1892 (Donnell Smith Herbarium no. 3060, type); Mongoy, Laguna de Guija, Department of Jutiapa, at an altitude of 1,330 meters, *Heyde & Lux*, flowers, April, 1894 (Donnell Smith Herbarium no. 6348).

This species was first distributed under the name of *Metastelma pedunculare* Decaisne,[a] and then transferred to *M. barbigerum* Scheele.[b] The characteristics given by Decaisne for the first plant certainly do not apply to the specimens collected by Heyde and Lux, but neither do these agree with Scheele's description and the Lindheimer specimen in the National Herbarium. The stems and branchlets are rather thick and not glabrous, the cymes are not few (4 or 5)-flowered, the pedicels are distinctly pubescent, the broader lobules of the corolla are scarcely barbate and on the margin only, the gynostegium is much longer, etc. And if we admit with Corry,[c] Malme,[d] and others that the translatoria are in themselves sufficient to characterize species, we are forced to the absolute conclusion that there exists no near kinship between the Texan and the Guatemalan species. We reproduce here our camera lucida drawings of the translatoria of both *M. barbigerum* and *M. decipiens*. In the first, the retinaculum is 0.2 mm. long, 0.07 mm. broad, the caudicles are thick, and the pollinia long pear-shaped.

**Metastelma sepicola** Pittier, sp. nov. FIGURE 5.

A trailing, subvoluble vine, with slender, rounded, ramified stems. Internodes 2.5 to 3.8 cm. long.

Petioles slender, about 5 mm. long, sulcate, minutely hairy above. Leaf blades ovate, 15 to 30 mm. long, 5 to 15 mm. broad, acuminate, rounded at base, entirely glabrous except above on the main nerve, here pubescent, generally with two small glands at the insertion of the petiole, dark green above, grayish green below; margin entire, minutely and sparsely ciliate.

Cymes axillary, pedunculate; flowers small, up to 8 in each cyme. Peduncles slender, 5 to 15 mm. long, minutely hairy. Pedicels 1 to 2.5 mm. long. Calyx perceptibly verrucose outside, about 1 mm. long; lobes ciliate, rounded at tip, 0.7 mm. long, 0.55 mm. broad, with a scarious margin; calycinal glands finger-like, single. Corolla about 2.75 mm. long, campanuliform, white, the lobes about 1.6 mm. long, 0.75 to 1 mm. broad, lanceolate, emarginate at tip, glabrous outside, provided inside with two papillose thickenings confluent at tip and leaving a smooth center and margin. Corona scales inserted at the base of the anthers, equal to or scarcely longer than the gynostegium, arcuate, spathuliform, with the margin invo-

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[a] DC. Prodr. **8**: 514. 1844.
[b] Linnaea **21**: 760. 1848.
[c] Trans. Linn. Soc. Lond. Bot. II. **2**: 173–207. 1881–1887.
[d] Öfv. Vet. Akad. Förh. **1900**: 845. 1900.

lute at the base and the tip flat or rounded, the length 0.5 mm., the breadth 0.3 mm. Stamens 8.5 mm. long, with rather long filaments (1.1 mm.); apical membrane of the anther orbicular, slightly emarginate at tip, 0.3 mm. long, 0.45 mm. broad. Retinaculum about 0.14 mm. long, 0.06 mm. broad, naviculiform. Caudicles 0.12 mm. long, rather thick, articulate. Pollinia pendulous, elongate-pyriform, about 0.2 mm. long. Pistil smooth; styles about 1.4 mm. long.

Follicles not known.

COSTA RICA: Hedges around San José, altitude 1,150 meters, *Tonduz*, flowers, July, 1896 (Instituto fís.-geog. Costa Rica no. 10130; U. S. National Herbarium no. 471973, type); slopes above San Rafael de Cartago, *Pittier*, flowers, October 18, 1894 (Instituto fís.-geog. no. 9026).

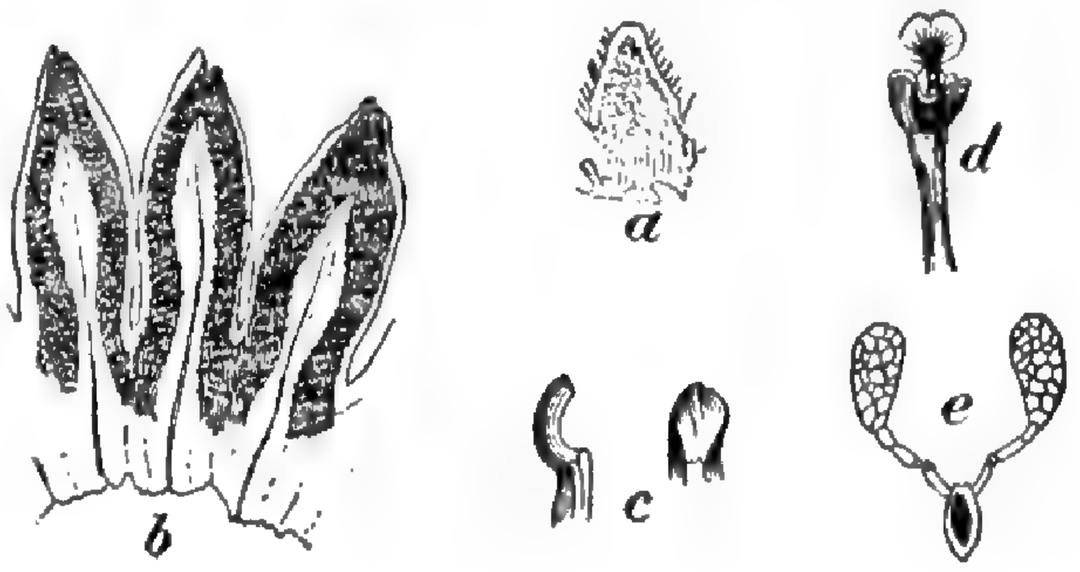



FIG. 5.—Flower parts of *Metastelma sepicola*. *a*, Lobe of calyx; *b*, part of corolla; *c*, scales of corona, lateral and front views; *d*, stamen; *e*, translatorium. *a–d*, Scale about 8; *e*, scale 32.

These Costa Rican specimens were ascribed to *M. pedunculare* Decaisne by Mr. Donnell Smith. They agree with the short description given by the author [a] as to their leaves, but the inflorescences are always shorter than there given, and the flowers, which develop successively, are mostly more than 5 in each cyme. The type of *M. pedunculare* which is in the Herbarium of the Paris Museum, was collected by Hartweg (sub no. 601) at the Cuesta de Pinula, near Guatemala City.

**Ditassa caucana** Pittier, sp. nov. FIGURE 6.

A milky, subligneous vine. Stems and branchlets tomentose, voluble, diffuse.

Leaves small, opposite, petiolate. Petioles hairy, 2 to 3 mm. long. Leaf blades lanceolate, 12 to 40 mm. long, 4 to 10 mm. broad, long-cuneate at base, mucronate at tip, dark green (in the dried state blackish), and sparsely hirsute above, densely tomentose and whitish underneath, with revolute margins.

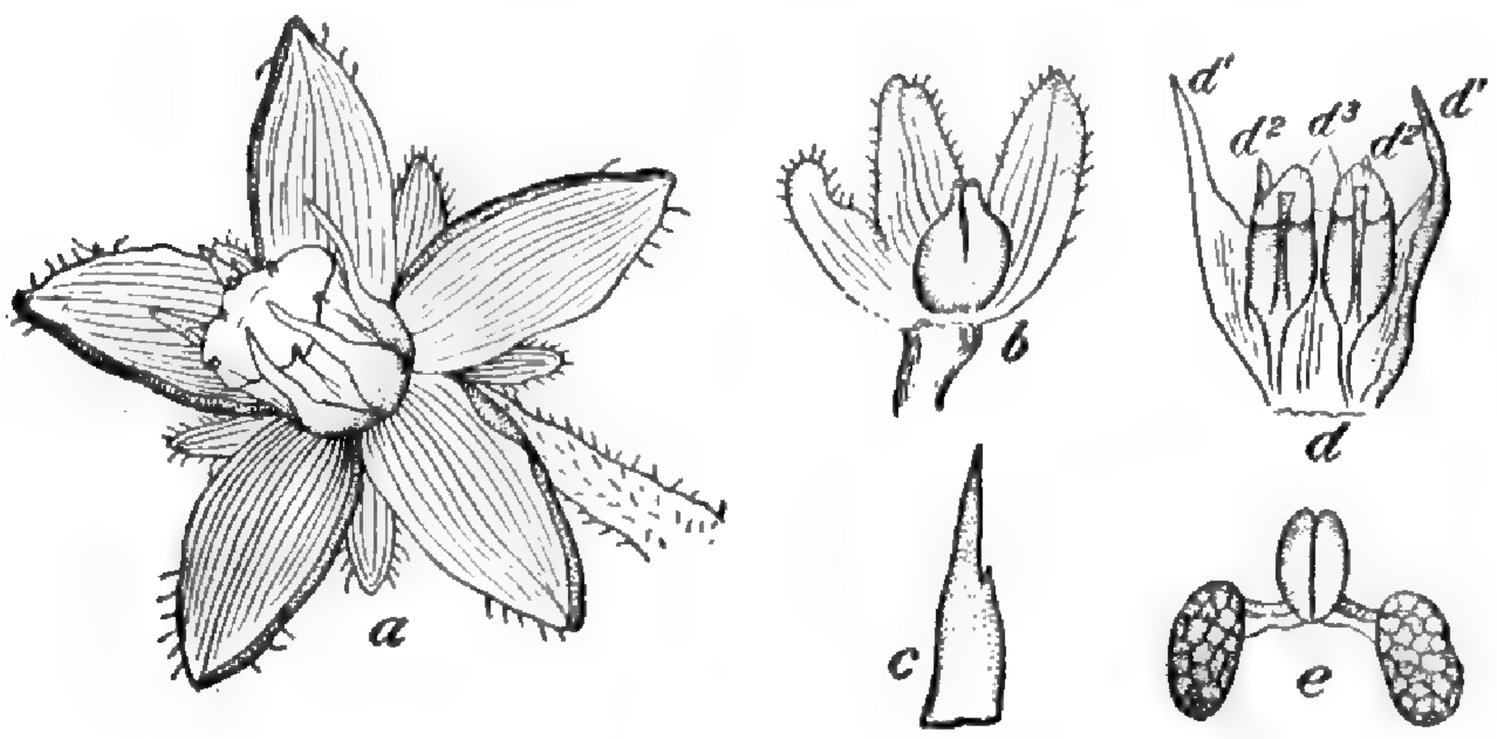



FIG. 6.—Flower parts of *Ditassa caucana*. *a*, Flower; *b*, ovaries and part of calyx; *c*, phyllum of the outer corona; *d*, front view of two stamens with the corresponding parts of the corona, showing comparative size; ($d^1$ $d^1$, phylla of outer corona; $d^2$ $d^2$, phylla of the inner corona; $d^3$, anthers); *e*, translatorium. *a–d*, Scale 9; *e*, scale 32.

Inflorescences cymose, axillary, and alternate, much shorter than the leaves. Pedicels densely hairy, 2 to 4 mm. long; bracteoles very small, ovate-lanceolate, hairy outside.

Calycinal lobes ovate-lanceolate, 1.4 mm. long, 0.6 mm. broad, inside with 5 cylindrical alternate glands. Corolla white, divided almost to the base into 5 ovate-lanceolate segments, these 2.3 mm. long, 1 mm. broad, sparsely hairy on both faces, striate longitudinally with dark lines and with a transparent, smooth right margin (covered in prefloration). Corona double; phylla of the outer row almost free, 1.8 to 2 mm. long, lanceolate, long-acuminate, with margins smooth or provided with one pair of symmetrical, more or less pronounced teeth; phylla of the inner row

[a] DC. Prodr. **8**: 514. 1844.

linear, 1.2 mm. long, adhering through their base to the gynostegium and slightly surpassing it. Pollinia small, ovoid (about 0.09 mm. long, 0.04 mm. broad), hanging from two short caudicles (about 0.024 mm. long); corpuscle broadly ovate (about 0.07 mm. long, 0.045 mm. broad). Gynostegium 1 mm. long. Stigmas obtuse.

Follicles not known.

A species of the section Orthotassa.

COLOMBIA: El Saladito above Calí, on the road to Buenaventura, Western Cordillera of Colombia, altitude, 1,800 meters, *Pittier*, 754, flowers, December 21, 1905 (U. S. National Herbarium no. 530945, type).

**Cynanchum reflexum** (Hemsl.) Pittier.

FIGURE 7.

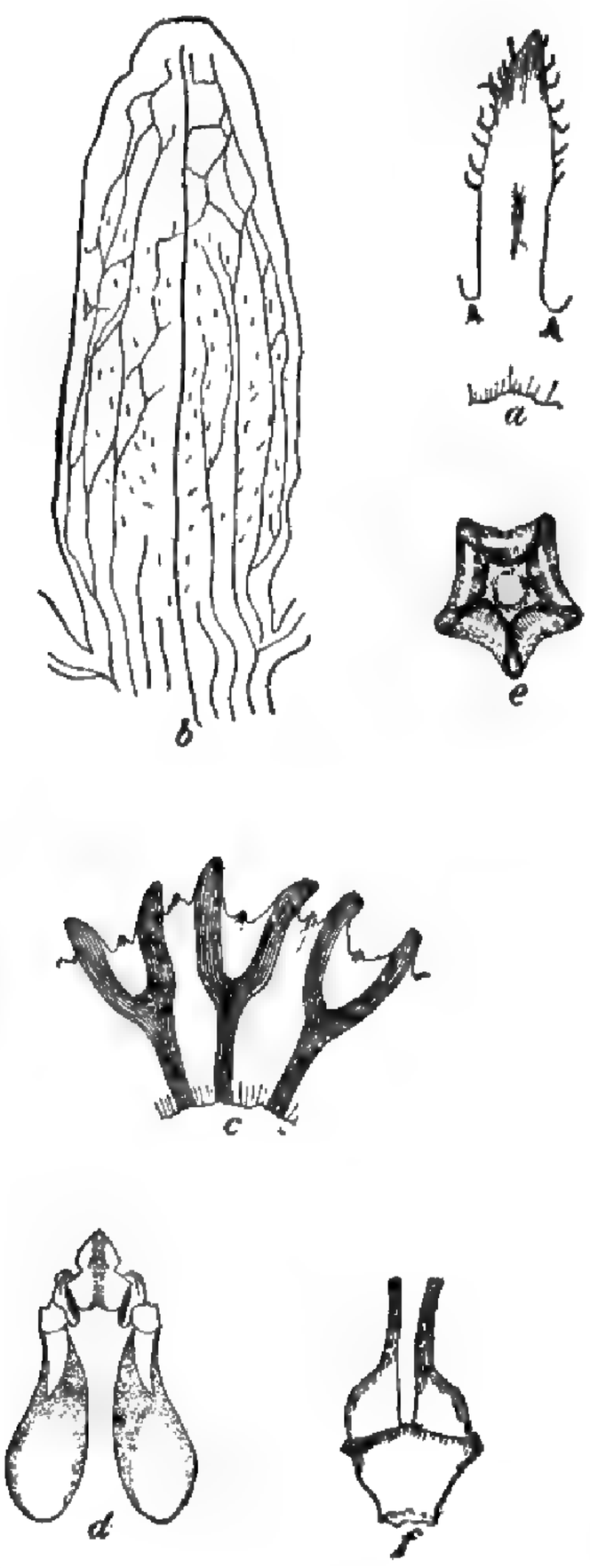



FIG. 7.—Flower parts of *Cynanchum reflexum*. *a*, Lobe of calyx; *b*, lobe of corolla; *c*, part of corona, outside view; *d*, translatorium; *e*, stigma; *f*, styles. *a*–*c*, *e*, *f*, Scale 5; *d*, scale 19.

*Gonolobus reflexus* Hemsl. Biol. Centr. Amer. **2**: 333. 1382.

Stems sublignose, little ramified, erect or spreading but scarcely voluble, covered with long, whitish, articulate hairs.

Leaves also densely strigose-hairy, rather thick; petioles short (1 to 1.5 cm.); leaf blades ovate-lanceolate, 6 to 10 cm. long, 2.5 to 5 cm. broad, rounded at base with two petiolar glands, acuminate, paler beneath. Cymes 4-flowered, umbellate, axillary, almost sessile. Pedicels 2 to 3 cm. long, strigose-hairy. Calyx small (4 to 4.5 mm. from base to tips), strigose-hairy outside, smooth inside with 5 small glands alternating with the lobes, these narrowly lanceolate, 3 mm. long. Corolla rotate, greenish, finely brown-reticulate within, sparsely hairy outside, with a very short but distinct tube and a glabrous throat; lobes 7.5 long, 3 mm. broad, oblong with rounded tips, reflexed. Corona simple, cupuliform, 2.5 mm. high, appendiculate inside, with 10 larger tips ending fibrovascular fascicles and separated by smaller membranous teeth. Gynostegium stipitate, the stigma almost even with the tips of the corona. Anthers without appendages. Retinaculum 0.26 mm. long, 9.16 mm. broad; caudicles broadly winged; pollinia pear-shaped, more or less deflexed, about 9.7 mm. long.

Follicles unknown.

COSTA RICA: Bushes at Las Vueltas de Tucurrique, Reventazon Valley, at 600 to 700 meters above sea level, *Tonduz*, flowers, January, 1899 (Instituto fís.-geog. Costa Rica no. 13004).

Notwithstanding some small discrepancies, the identity of this species, as established by Mr. Donnell-Smith, with the one from Chontales (Nicaragua) described by Mr. Hemsley under the name of *Gonolobus reflexus*, is pretty certain. But our plant differs so much, in its habit and the structure of its flowers, from the remaining Gonolobi of Central America, that the propriety of placing it in this genus is doubtful. The small flowers with minute calyx and reflexed lobes of the corolla are unusual in the latter. By the elongated, cuplike corona, with inner appendages each division of which is marked by a bifurcated fibrovascular fascicle ending in two large teeth, by the small size of the translatorium and the peculiar shape of its retinacle, and last by its stellate stigma, our plant comes nearer to the section Vincetoxicum of the genus

Cynanchum and should be called *C.* (*Vincetoxicum*) ***reflexum*** (Hemsley) Pittier, or *Vincetoxicum reflexum* Pittier, according to the status conceded said section. In transferring the species, we have followed the view of Dalla Torre and Harms and adopted the former name.

**Roulinia rensoni** Pittier, sp. nov. FIGURES 8, 9.

A voluble, slender, mostly glabrous vine.

Leaves rather sparse. Petioles thin, 1.5 to 3 cm. long. Leaf blades 4 to 6 cm. long, 1.5 to 3 cm. broad, thin, ovate, acuminate, more or less deeply emarginate or cordate at base, pale underneath.

Inflorescences corymbose, pedunculate, the lower flowers deciduous. Peduncles rather thick, 2 to 3 cm. long, followed by an often longer rachis. Pedicels more or less pubescent, 2.5 mm. long. Calyx 3.5 mm. long, deeply incised, glabrous; lobules 2.9 to 3.1 mm. long, 0.9 to 1 mm. broad, elongate-elliptic, obtuse at tip, ciliate; calycinal glands, when present, single or geminate. Corolla broadly campanulate, 5 to 5.4 mm. long, glabrous, deeply incised; lobules 4 mm. long, 1.5 to 1.8 mm. broad at base, contracted and bearing glandular-verrucose processes at about two-thirds of its total length and with rounded or slightly emarginate tips. Corona inserted at the base of the gynostegium, its lobes scarcely concrescent, their broader lower half with involute margins, the upper half trilobulate, the lateral lobules scarcely salient, and the middle one forming an acute point inflexed on the gynostegium; total length of the corona 2.2 mm.; length of lower part 1.2 mm., of the middle lobule about 1 mm. Stamens about 1.8 mm. long; anthers 1.3 mm. long, 1.2 mm. broad with a rounded apical membrane. Retinaculum 0.35 mm. long, 0.20 mm. broad, broadly fusiform, pointed at summit, often bicuspidate at base; caudicles about 0.23 mm. long, narrow at base, nearly 0.18 mm. broad at tip; pollinia ovoid,

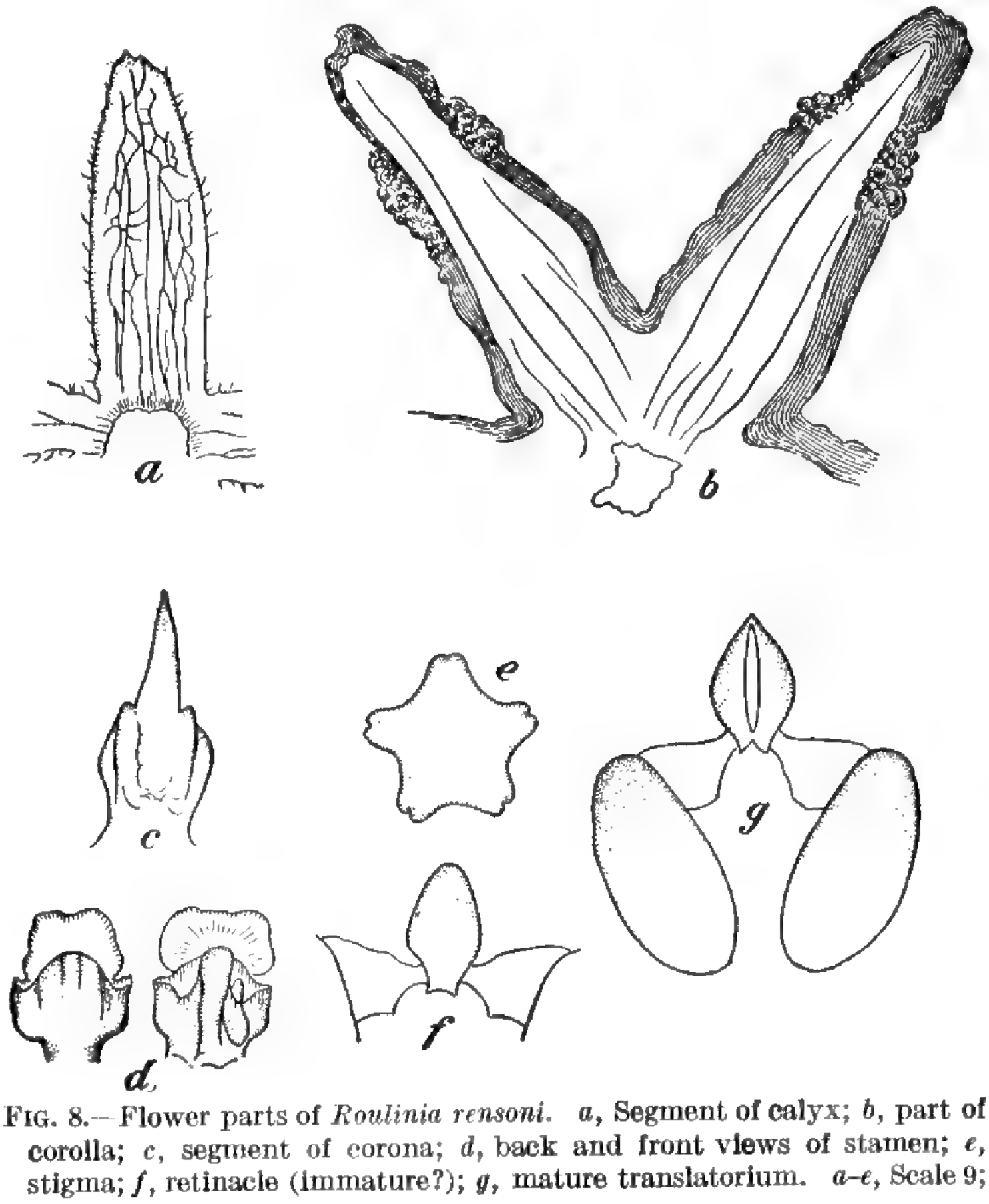



FIG. 8.—Flower parts of *Roulinia rensoni*. *a*, Segment of calyx; *b*, part of corolla; *c*, segment of corona; *d*, back and front views of stamen; *e*, stigma; *f*, retinacle (immature?); *g*, mature translatorium. *a–e*, Scale 9; *f*, *g*, scale 32.

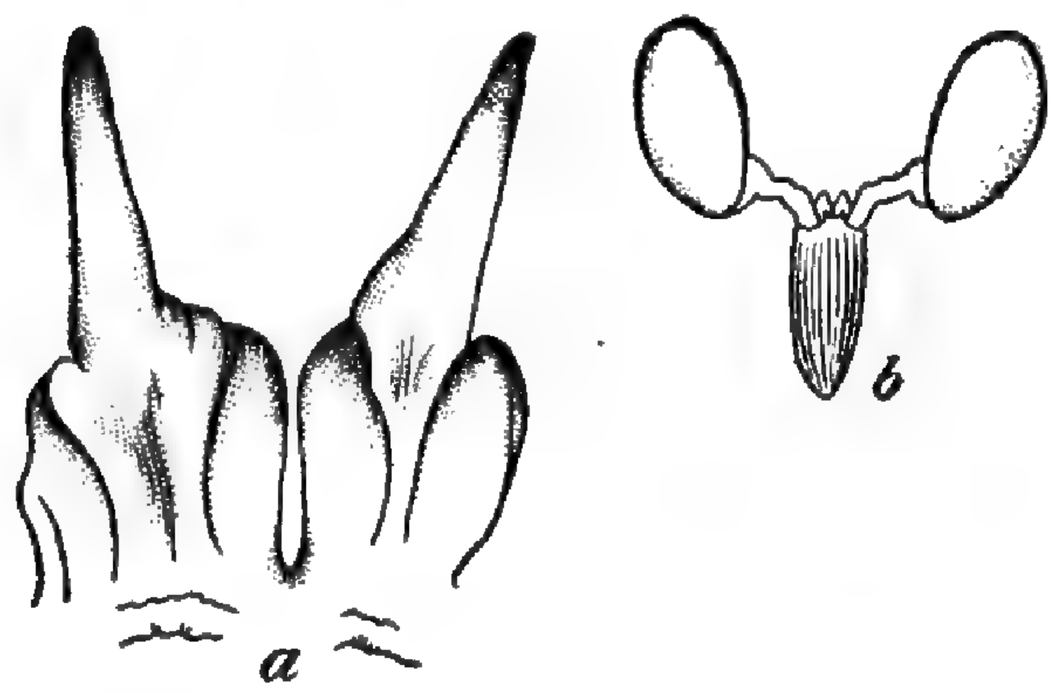



FIG. 9.—Flower parts of *Roulinia ligulata*. *a*, Part of corona; *b*, retinacle. *a*, Scale about 8; *b*, scale 32.

0.6 mm. long, 0.25 mm. in diameter. Stigmatic head flat, starlike, about 1.4 mm. in diameter.

Follicles not known.

EL SALVADOR: Near San Salvador, without further indications, *Renson* 313.

**Marsdenia mollissima** Fourn. in Mart. Fl. Bras. **64**: 322. *pl. 95*. 1885. FIGURE 10.

Leaves 5 to 10 cm. long, 3 to 7 cm. broad, the lower face whitish ferruginose with dark veins; petioles 3 to 4 cm. long. Peduncles 2 to 5 mm. long, provided at the base with a lanceolate bract, about 17 mm. long. Calyx lobes ovate-oblong, decreasing from outside inward, the exterior one 6 to 6.5 mm. long, 2 to 2.5 mm. broad, the inner one 4 mm. long, 2 mm. broad. Tube of corolla 5 to 6 mm. long, yellow at the base and provided near the same with 5 tufts of white hairs, the purple throat covered with a whitish pubescence; tips of the lobes yellow. Scales of the corona thickly mucronate, about 2 mm. long, opaque and blackish. Retinacles 0.17 mm. long, naviculiform; caudicles 0.33 mm. long; pollinia long-pyriform, 0.8 mm. long. Follicles not known.

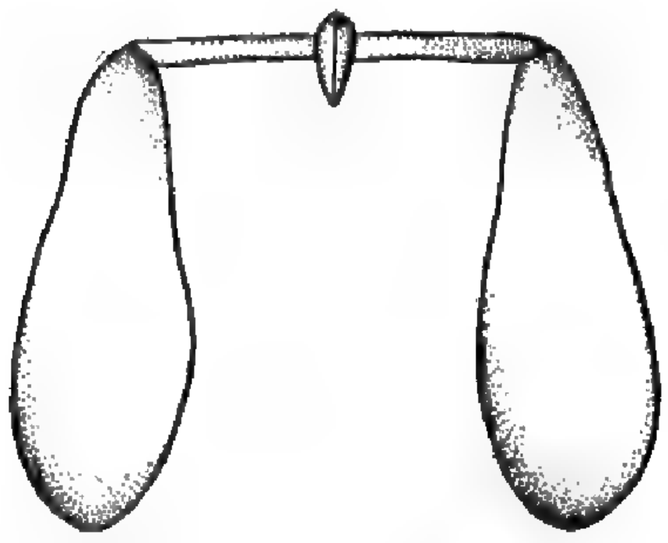


FIG. 10.—Translatorium of *Marsdenia mollissima*. Scale 32.

COLOMBIA: In hedges around Barranquilla (State of Bolivar), *Pittier* 1563, flowers, June, 1906 (U. S. National Herbarium no. 600012).

The above data are intended to complete Fournier's description, which applies to our plant in most details. This species had never been reported heretofore west of Dutch Guiana.

**Marsdenia nicoyana** Pittier, sp. nov. FIGURE 11.

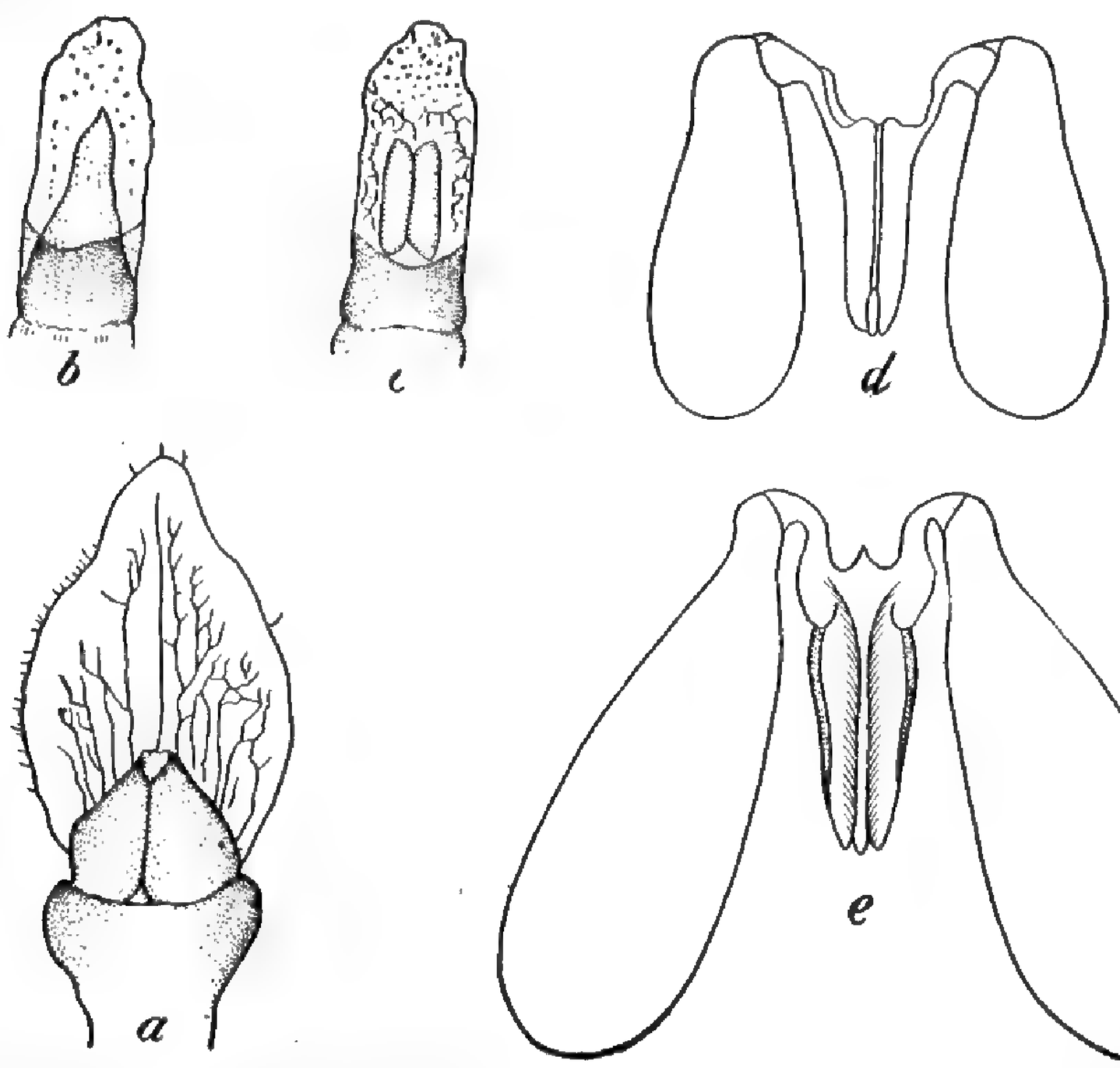



FIG. 11.—Flower parts of *Marsdenia nicoyana* and *M. propinqua*. Of former, *a*, part, showing calyx lobe and ovaries; *b*, anther, from the back, with segment of corona; *c*, anther, front view; *d*, translatorium. Of latter, *e*, translatorium. *a*–*c*, Scale 9; *d*, *e*, scale 32.

A laticiferous vine, climbing but not voluble, with short, floriferous branchlets. Stems woody, slender, with grayish bark.

Leaves opposite, rather small, petiolate. Petioles slender, 2.5 to 3 cm. long. Leaf blades elliptic-ovate, obtusely acuminate, 5 to 10 cm. long, 2 to 5 cm. broad, rounded

at the base, smooth, light green above, glaucous underneath; primary veins opposite or alternate, ascending, the broad interspaces finely reticulate; margin smooth, revolute; a tuft of gland-like organs on the main nerve on the upper face and near the base of the leaf blade.

Flowers greenish, in pedunculate axillary umbels; peduncles 6 to 10 mm. long, subfurfuraceous; pedicels brownish, furfuraceous, provided with small lanceolate, hairy bracteoles. Calyx 4 mm. long, with rounded lobes 2 mm. broad, hirsute outside, smooth inside, and ciliate on the margins. Corolla 4 to 7 mm. long; tube 2 to 3 mm. long, shorter than the calyx; lobes elliptic, rounded at tip, smooth and ciliolate. Segments of the staminal crown lanceolate, by one-third shorter than the anther-bearing laminæ. Lamina rounded, perfectly transparent at tip and dotted with starry, gland-like, minute, opaque spots. Translatoria rather small; pollinia about 0.3 mm. long; corpusculum about 0.18 mm. long. Ovary bilocular, 1 to 1.5 mm. long, smooth; stigmatic head pointed and bifid.

Follicles not known.

COSTA RICA: Along roads at Nicoya, *Tonduz*, flowers, April, 1900 (Instituto fís. geog. Costa Rica no. 13909; U. S. National Herbarium no. 577899, type).

This species differs from the other described Central American forms by having the scales of the staminal crown shorter than the staminal laminæ; the pollinia are also reduced in size; the leaves are somewhat similar to those of *M. edulis* Watson, but are distinctly rounded, and not subdecurrent, at the base, blunt and not acutely pointed at tip; their shape is more constant and the flowers in the umbel are more numerous.

Several specimens in the U. S. National Herbarium, collected in Central America, have been referred to *M. maculata* Hooker, but to my mind these identifications are very doubtful, and the whole section needs a thorough revision.

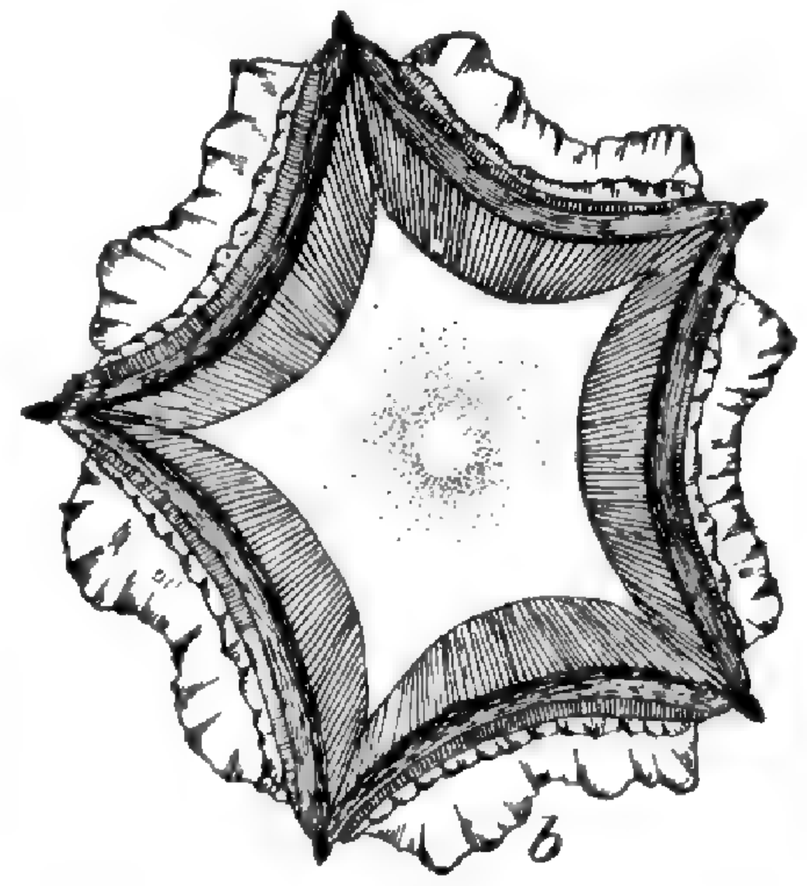



FIG. 12.—Flower parts of *Gonolobus edulis*. *a*, Translatorium; *b*, gynostegium, from above. *a*, Scale 32; *b*, scale about 8.

**Gonolobus edulis** Hemsl. Biol. Centr. Amer. **2:** 331. 1882. FIGURE 12.

A vine, subvoluble or most generally creeping on low bushes, fallen trunks, or walls. Stems hairy, rounded, little ramified.

Petioles 2.5 to 4 cm. long, slender, hairy. Leaf blades 4 to 7 cm. long, 1.5 to 3.5 cm. broad, oblong-lanceolate, acuminate, shallow-cordate at base with broad sinus and rounded auricles, sparsely hairy, dark green above, paler with prominent brownish-hairy venation beneath. Two or more small glands at the insertion of the blade on the petiole.

Inflorescences cymose, axillary, unilateral, 3 to 5-flowered. Peduncles, pedicels, and bracteoles hairy; peduncles 1 to 2 cm. long; pedicels 1 to 3 cm. long; bracteoles small, linear. Calyx shortly campanulate, membranous, hairy outside, smooth

inside, its divisions 10 mm. long from center, narrowly lanceolate, acuminate, alternating with small, tongue-shaped, pale glands. Corolla subcampanulate, pubescent outside, woolly inside, pale yellow, with spreading divisions, these 12 to 14 mm. long from insertion on tube, broadly lanceolate with more or less twisted tips. Outer corona 5-lobulate, inconspicuous; inner corona formed of 5 trapezoid brown scales, lying flat against the gynostegium and each bearing an inner radial lamella. Gynostegium stipitate; anthers broad, with horizontal cells, and covered with a thin membrane, extended exteriorly in a broad but short lobe. Retinaculum scutelliform 0.30 mm. broad; caudicles horizontal or subpendulous; pollinia claviform, 1.5 mm. long. Ovaries glabrous, subglobose; styles about 2.5 mm. long, connate for their upper half; stigma about 4.4 mm. in diameter, star-shaped, smooth, with a little knob in the center, corresponding with the stigmas.

Follicles large (10 to 12 cm. long, 5 cm. thick), fusiform, with 5 longitudinal wings.

COSTA RICA: Endres 213, type in Kew Herbarium; hedges around San Francisco de Guadalupe, altitude 1,270 meters, *Tonduz*, flowers, May, 1893 (Instituto fís. geog. Costa Rica no. 8003; U. S. National Herbarium no. 471846); same locality, *Tonduz*, flowers, July, 1894 (Instituto fís. geog. Costa Rica no. 8897; U. S. National Herbarium no. 334001); San José, 1,100 meters, *Donnell Smith* 6651, flowers, May, 1896.

The fruits of this species, known by the name of "cuayote" or "guayote" among the natives, are edible when still tender.

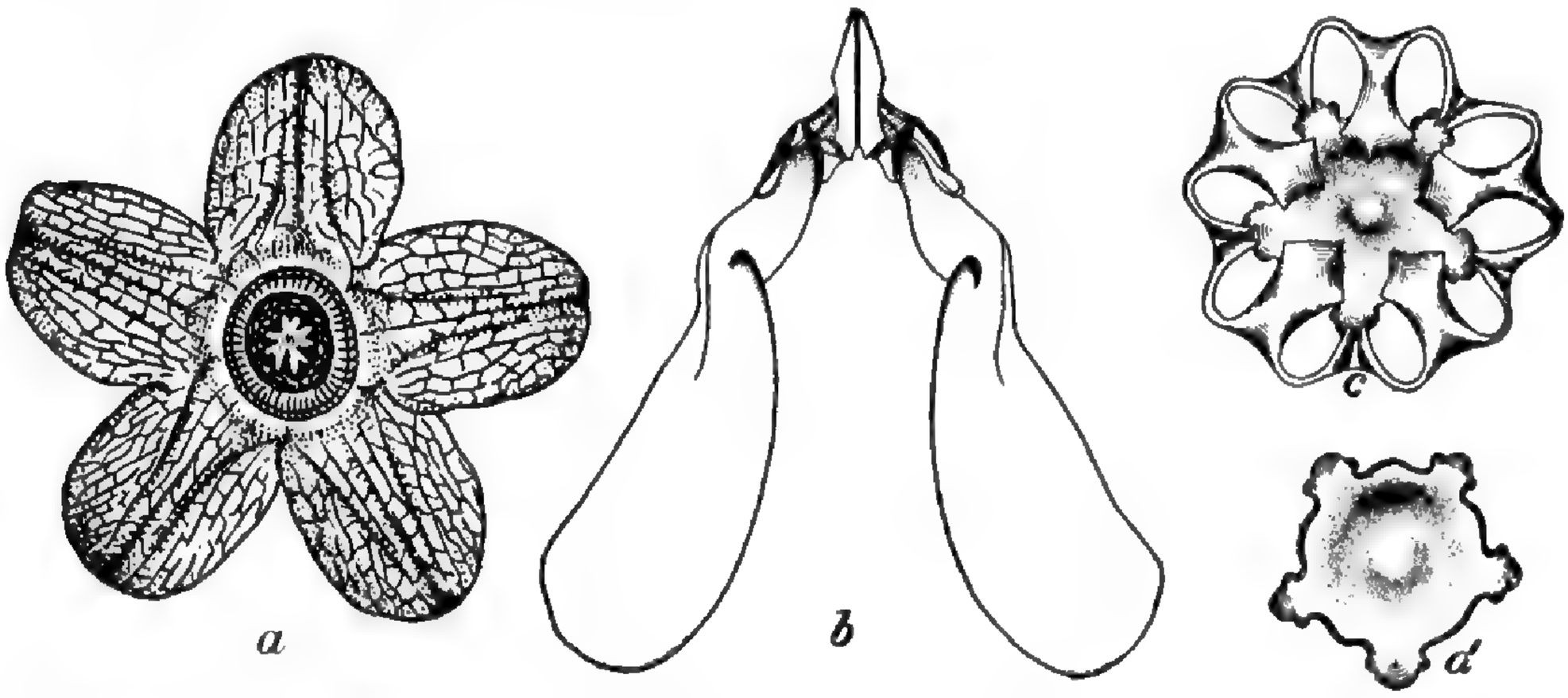



FIG. 13.—Flower and flower parts of *Gonolobus magnifolius*. *a*, Flower; *b*, translatorium; *c*, gynostegium, from above; *d*, stigma. *a*, Natural size; *b*, scale 21; *c*, *d*, scale about 6.

**Gonolobus magnifolius** Pittier, sp. nov. FIGURE 13.

A vine with round, slender, lignose, hairy, little ramified stems.

Leaves very large. Petioles rather thick, 10 to 18 cm. long, hairy, sulcate. Leaf blades cordiform, acuminate, 21 to 24 cm. long, 18 to 22 cm. broad, deep green and pubescent above, brownish and thickly hairy, principally on the prominent veins underneath, beset with numerous setaceous glands at the insertion on the petiole.

Inflorescences cymose, axillary, unilateral, loose, with 6 or more large flowers opening in succession. Peduncles, pedicels, and bracteoles densely hairy; peduncles thick, 5 to 8 cm. long; pedicels 5 to 6 cm. long when fully developed, provided with basal bracteoles, linear-lanceolate, 8 to 10 mm. long. Calyx deeply incised; lobes ovate, 12 mm. long from center, 8 mm. broad, thickly hairy outside, pubescent inside, alternating with 5 rather large, brownish, transparent glands. Corolla large (38 to 40 mm. in diameter), flat, greenish yellow, finely reticulate, pubescent outside, glabrous inside; lobes ovate, 8 to 10 mm. long from the sinuses, 10 to 12 mm. broad. Outer corona obtuse, but forming a conspicuous ring about 9 mm. in diameter around the interior parts, at the throat of the corolla; inner corona thick, torulose, dark brown and bearing 5 lamellar, rounded tips standing erect against the stamens. Gynostegium equaling

or scarcely surpassing the inner corona. Stamens elongate, glabrous; anthers vertical, opening at the top and covered by a scutelliform blade reflexed on the stigma. Retinacles 0.5 mm. long, 0.17 mm. broad; pollinia pendulous, large (1.3 mm. long, 0.55 mm. in larger diameter). Ovaries very hairy. Stigma salver-like, with 5 trilobulate tips alternating with the anthers.

Follicles not known.

Costa Rica: Forests of Las Vueltas de Tucurrique, Reventazon Valley; altitude 635 to 700 meters, *Tonduz*, flowers, March, 1899 (Instituto fís. geog. Costa Rica no. 13022; U. S. National Herbarium no. 472247, type); Valley of Tuis, Reventazon basin, altitude 600 meters, *Pittier*, flowers, September, 1901 (Instituto fís. geog. Costa Rica no. 16213); *Tonduz*, flowers, November, 1897 (Instituto fís. geog. Costa Rica no. 11554).

This plant, strikingly distinct from any other species of the genus and especially from the other Costa Rican species, was named *Gonolobus pittieri* in schedule by the late K. Schumann. We change this specific name to *magnifolius*, which reminds one of the good characters of the plant. It is a milky vine, growing in the shaded, hilly forests of the lower Atlantic slope and very seldom found with flowers or fruits. Mr. Donnell Smith identified the several specimens of this plant in his collection as *Gonolobus viridiflorus* Roem. & Schultes, a species from the low lands of Brazil and the Guianas that is cited [a] as having been collected near Cartago by Oersted. But a careful comparison of the said specimens with the original diagnosis [b] and the descriptions in the Botanical Register [c] and the Flora Brasiliensis [d] does not confirm this view.

**Gonolobus pseudobarbatus** Pittier, sp. nov. Figure 14.

Stems voluble, round, covered with a dense, short pubescence, intermingled with long, soft, brownish hairs.

Leaves soft, of medium size. Petioles slender, 2.5 to 3 cm. long, at once short-pubescent and pilose like the stems. Leaf blades 4 to 6 cm. long, 2 to 4.5 cm. broad, rounded-ovate to ovate-lanceolate, cordate with generally broad rounded sinus and auricles, acuminate; glandules at insertion of peduncles numerous and small; upper face dark green, sparsely hairy on the veins and punctate; lower face greenish white, with prominent, hairy, brown veins, and covered with minute, purple, gland-like hairs; margin ciliate; acumen conspicuously barbate.

Inflorescences umbellate, with 6 to 10 small flowers opening in succession. Peduncles and pedicels hairy-pubescent, the former thick, about 2 cm. long, the latter slender, about 3 cm. long when fully developed. Bracteoles small, lanceolate, barbate. Lobes of calyx lanceolate, acute, about 5 mm. long, 2 to 2.5 mm. broad, densely covered outside with long, soft hairs, smooth inside, alternating with small, claviform, translucent glands. Lobes of corolla ovate, obtuse, 7 mm. long, 4 mm. broad, greenish yellow with dark venules, covered outside with long soft hairs intermingled with dark, gland-like spots, smooth inside except along the right margin, which is partly covered with coarse white hairs. Corona prominent, fleshy, torulose, subpentagonal, of a purple color, with 5 spathulate appendages inserted at the inner angles and connected with the gynostegium. Gynostegium rather long-pedicellate. Anthers opening above and horizontally, with inconspicuous outer appendages. Retinacle 0.3 mm. long, 0.15 mm. broad, scutelliform; caudicles and pollinia pendulous, the latter about 0.75 mm. long. Ovaries free and smooth.

Follicles not known.

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[a] Biol. Centr.-Amer. **2:** 335. 1882.
[b] Syst. Veg. **6:** 61. 1820.
[c] **13:** *pl. 1126.* 1827.
[d] **6:** 36.

COSTA RICA: Cerro de San Isidro near San Ramon, at an altitude of about 1,300 meters, *A. Brenes*, flowers, June 14, 1901 (Instituto fís. geog. Costa Rica no. 14504; U. S. National Herbarium no. 579710, type).

This specimen comes near *G. nigrescens* Schlecht. in the size and some details of the flower and reminds likewise of *G. barbatus* H. B. K., especially by the peculiar appendages along the inner right margin of the petals, but by some other important characters it is conspicuously distinct from the remaining Central-American species.

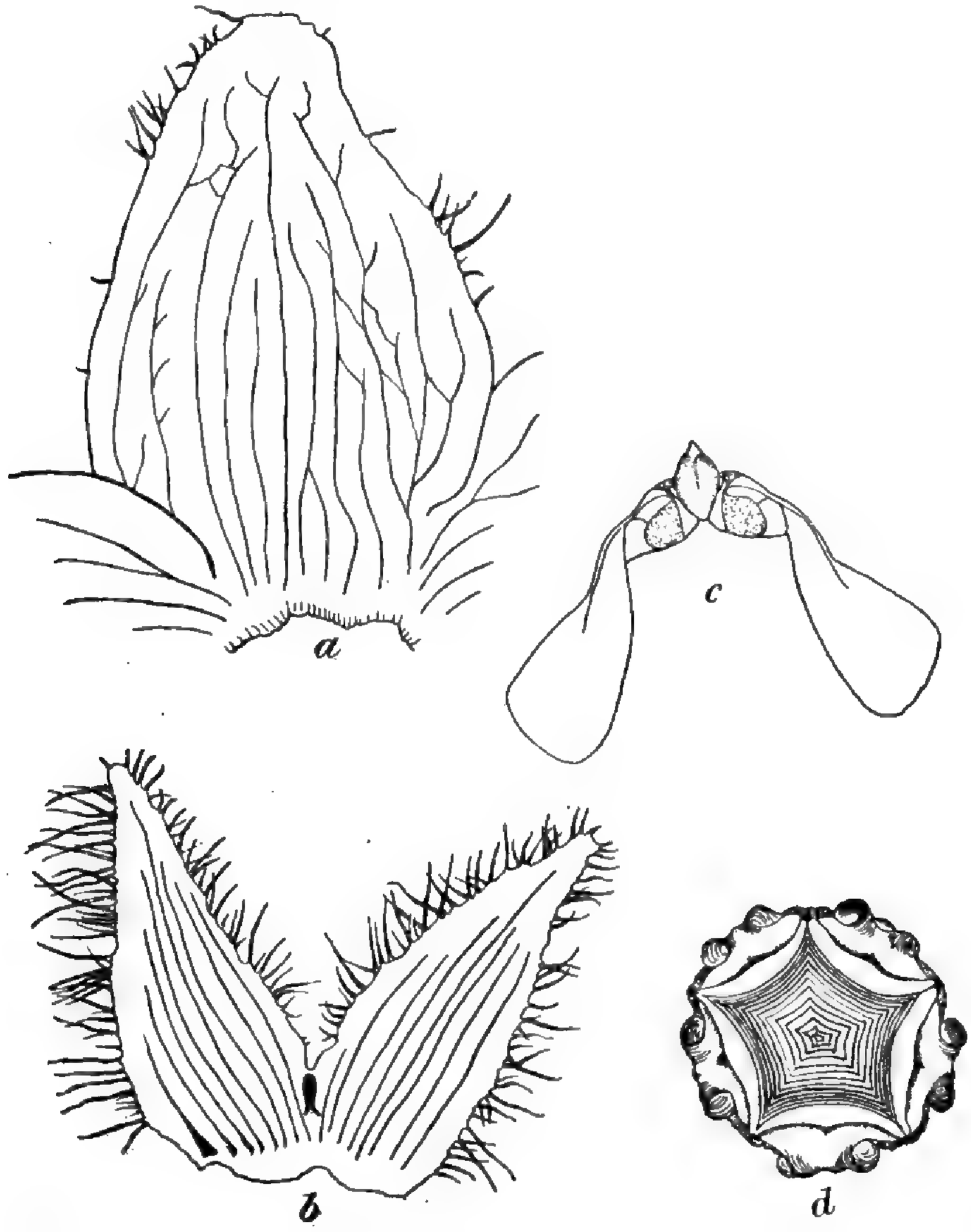



FIG. 14.—Flower parts of *Gonolobus pseudobarbatus*. *a*, Calyx lobes; *b*, corolla lobes; *c*, translatorium; *d*, gynostegium, from above. *a*, *b*, *d*, Scale 8; *c*, scale 30.

**Gonolobus dubius** Pittier, sp. nov. FIGURE 15.

Stems numerous, sublignose, suberect or spreading, hairy. Internodes unequal, mostly long (up to 20 cm.), the plant thus appearing sparsely foliated.

Petioles slender, 2 to 4 cm. long, minutely pubescent. Leaf blades 4 to 7 cm. long, 2 to 5 cm. broad, ovate-acuminate, cordate at base, with the rounded auricles very open at earlier stages and close later; upper face dark green, subglabrous; lower face sparsely hairy, pale or brownish, with salient, minutely hirsute venation; two small glands at the insertion of the blade upon the petiole.

Inflorescences axillary, of few (1 to 4) flowers. Peduncles and pedicels minutely pubescent, the former 1 to 2 cm. long, the latter 3 to 4 cm. long and very slender. Calyx lobes lanceolate-acuminate, 10 to 11 mm. long, 2.5 mm. broad, minutely pubescent outside, smooth inside, sparsely ciliate on the margin, a minute, pointed, yellow gland at each intervening sinus. Corolla 3 to 4 cm. in diameter, stellate-pubescent

outside, smooth inside, greenish yellow, the lobes longitudinally striate with darker lines, narrowly triangular-acuminate, 15 to 16 mm. long, 5 to 6 mm. broad at the base. Exterior corona reduced to a narrow, membranous, ciliate ring inserted on the throat of the corolla; inner corona formed of 5 fleshy, brownish scales, connected together by alternating folds and imbricate. Gynostegium stipitate. Appendages of the anthers more or less spreading, dark-colored. Retinaculum about 0.22 mm. long; caudicles about 0.3 mm. long; pollinia pear-shaped, about 1.2 mm. long, 0.4 mm. broad. Stigma pentagonal, concave.

Follicles not known.

COSTA RICA: Over bushes at Jericó Farm, Llanos de Santa Clara, altitude 300 meters, *Pittier*, flowers, July, 1899 (Instituto fís.-geog. Costa Rica no. 13416).

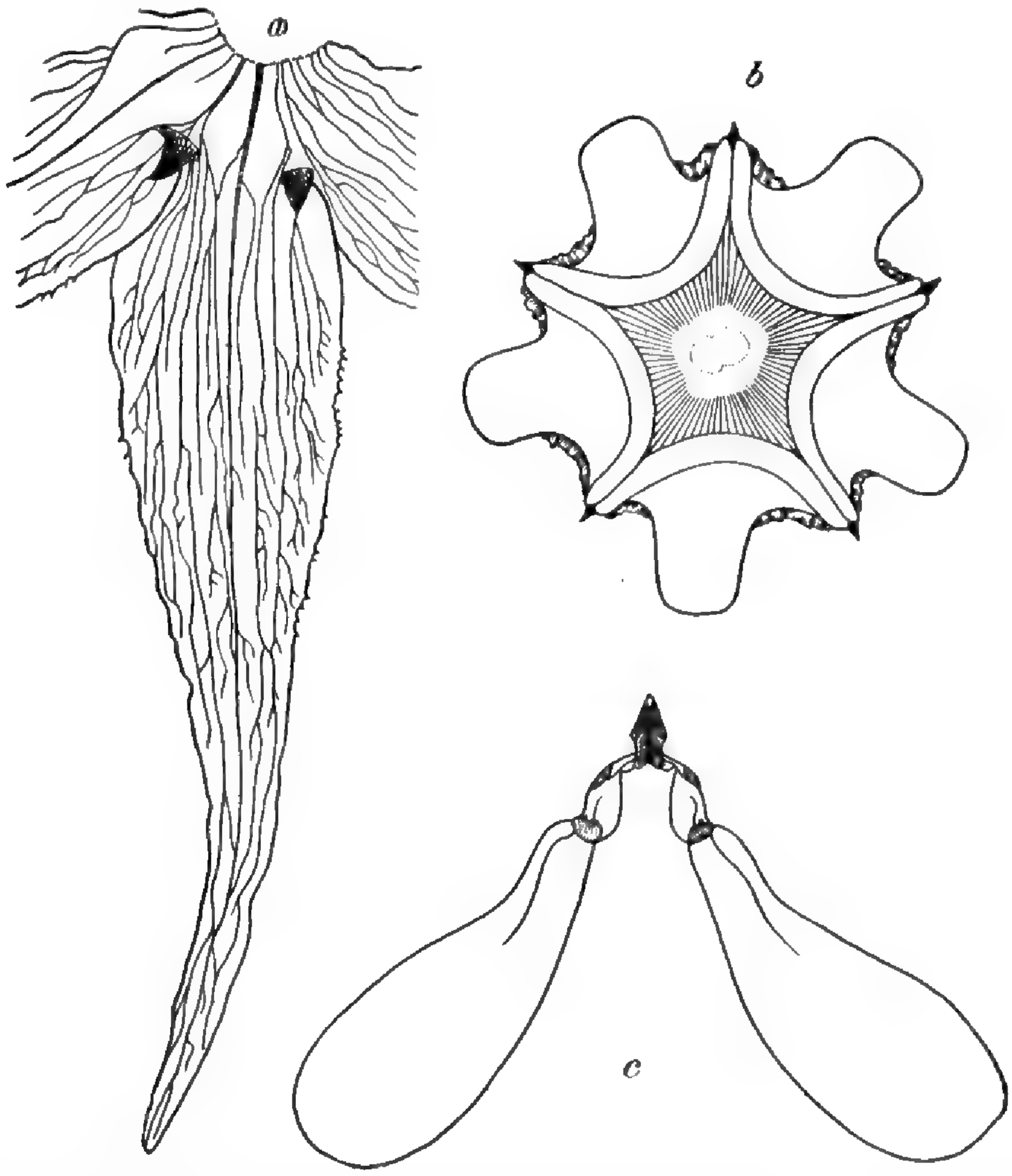



FIG. 15.—Flower parts of *Gonolobus dubius*. *a*, Part of calyx, showing glands; *b*, gynostegium from above; *c*, translatorium. *a*, *b*, Scale 8; *c*, scale 30.

Mr. Donnell Smith identifies this plant with *G. striatus* Mart. & Gal.[a] Although the very incomplete description of this latter species applies in a general way to our specimens, the identity of the two is very doubtful. *Gonolobus striatus* is a native of comparatively cold, dry, and mountainous country north of Mexico City and has not been found in the intervening region, whereas the Costa Rican plant proceeds from the humid and warm plains of Santa Clara. The presence of the same species at two stations at once so far apart and so distinct as to their climate would be quite exceptional. To remain on the safer side, we shall then consider our plant as a distinct species, until a direct comparison of types can be effected.

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[a] See Bull. Acad. Sci. Belg. **11**[1]: 365. 1844.

**Exolobus albomarginatus** Pittier, sp. nov. FIGURE 16.

A low trailing shrub, with erect axillary branchlets. Stems rounded, obscurely striate longitudinally and covered with stiff hairs. Branchlets finely pubescent, 15 to 20 cm. long.

Leaves opposite, long-petiolate. Petioles pubescent, slender, 4 to 6 cm. long. Leaf blades broadly ovate to lanceolate, acuminate, 4 to 9 cm. long, 2 to 5 cm. broad, with a deep and wide open basal sinus and rounded auricles; upper face deep green, almost smooth or sparsely hairy, with 4 small glands at the base of the main nerve; lower face pale green, pubescent on the prominent, finely anastomosed main and secondary nerves; margin revolute.

Inflorescences axillary, forming lax, few-flowered panicles. Peduncles pubescent (as are also the pedicels), shorter than the petioles. Bractlets subulate, hairy. Pedicels slender, 2 to 4 cm. long. Sepals lanceolate, acute, about 1 cm. long, 2.5 to 3 mm. broad at base, densely hairy outside, smooth inside, each alternating with an inside yellow gland. Corolla 4 cm. in diameter, deeply divided into 5 lobes, these 4 mm. broad at the base, long (18 mm.), acute, reflexed, pubescent outside, almost smooth inside, deep apple-green with darker longitudinal lines and a narrow, pure white margin, the whole turning uniformly brown in desiccation. Outer crown membranous, green, forming 5 obtuse lobes, hairy outside and ciliate on the margin. Inner crown dark purple, slightly higher than the outer one, with an inwardly recurved, beak-like tooth opposed to each lobe of the former and united to the gynostegium by a thin, vertical membrane. Appendages of the anthers 2-lobate, rather broad, pendulous. Retinaculum about 0.28 mm. long;

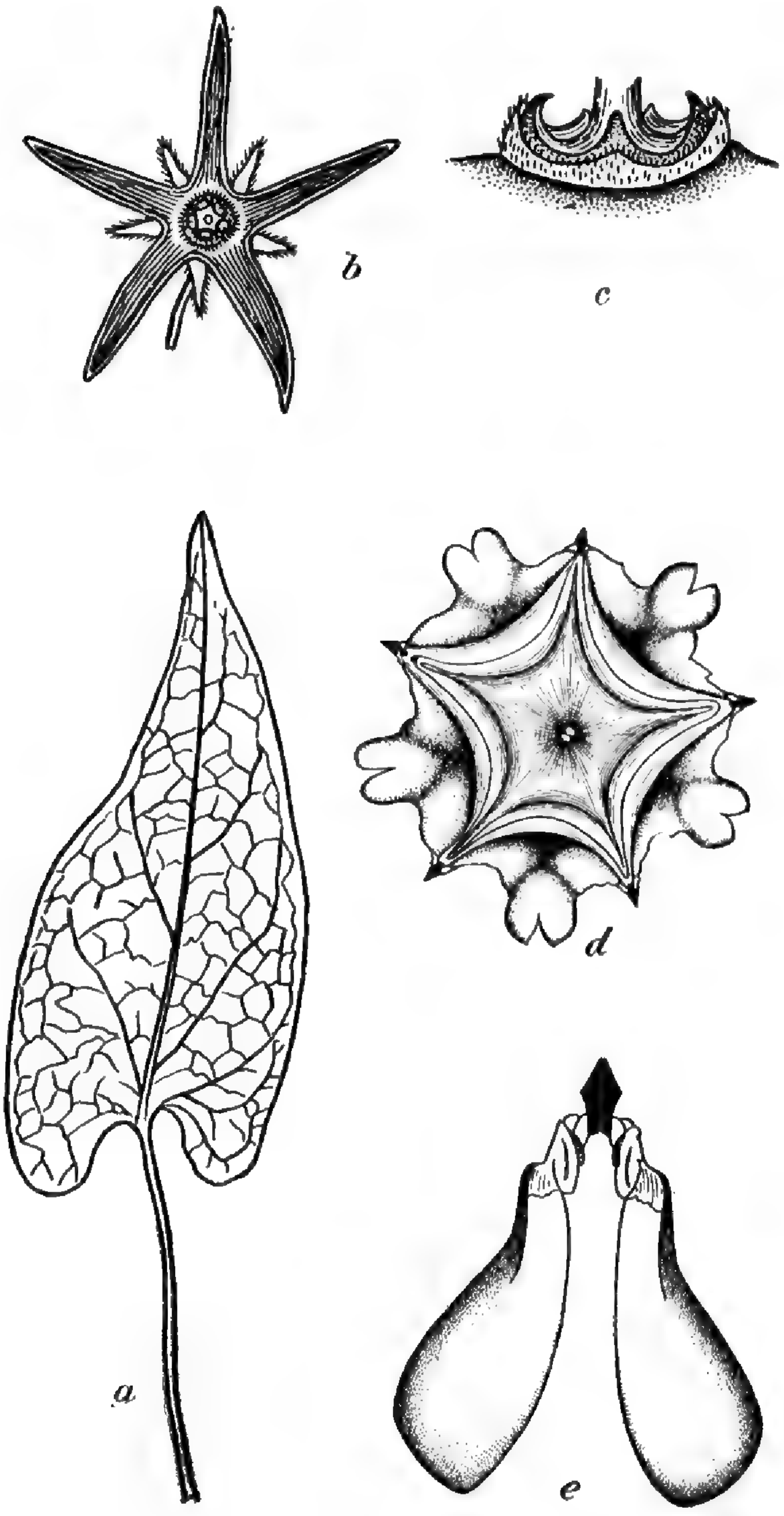



FIG. 16.—Parts of *Exolobus albomarginatus*. *a*, Leaf; *b*, flower; *c*, crown; *d*, gynostegium from above; *e*, translatorium. *a*, *b*, Natural size; *c*, scale about 5; *d*, scale 8; *e*, scale 31.

pollinia long pear-shaped, about 1.15 mm. long, subhorizontal. Stigma pentagonal, slightly concave.

Follicles not known.

COSTA RICA: Covering the trunks of fallen trees at Chirripó Farm, Zent Plains, on the eastern coast, *Pittier*, flowers, February, 1900 (Instituto fís.-geog. Costa Rica no. 16040; U. S. National Herbarium no. 573016, type).

This Costa Rican species of Exolobus is the first representative of this genus, which is mostly Brazilian, signalized in Central America. It is probable, however, that the monotypic genus Trichostelma, founded by Baillon [a] on a Mexican species, must also be referred to this genus, the only apparent difference being in the two lobules that mark the center of the stigmatic surface. Our species comes near *E. patens* (Decaisne) Fourn., from which it differs principally by the 4 glandules at the base of the leaf blade, by the form of the sepals, and by the characteristic white margin of the petals.

## THE TRUE PLACE OF SOME SUPPOSED ENSLENIAE FROM MEXICO AND CENTRAL AMERICA.

Under the name of *Enslenia? ligulata*, Bentham [b] described a plant collected by Hartweg at Aguascalientes, Central Mexico. As indicated by the ? sign, the author was doubtful as to whether the use of the generic name Enslenia was justified. Later, other specimens from the same country and from Central America have been assigned to the same species, and the interrogation mark has disappeared without any indication of the dubious question ever having been settled. The discovery by Dr. Renson of a new Roulinia led me to take up the case, with the conclusion that *Enslenia? ligulata* Benth., as well as several of the specimens collected later in Middle America and found under the Enslenia cover in the U. S. National Herbarium, must be transferred to the said genus Roulinia.

The genus Enslenia was established by Nuttall, [c] who gives as its nearest relatives Cynanchum and Asclepias. The type species is *E. albida*, collected "near Shepherdstown, on the gravelly banks of the Potomac, Virginia." Very good drawings of the characteristic features of this species have been given by Karsten, [d] together with those of his *Enslenia volubilis*.

The closely related genus Roulinia, on the other hand, was named and described for the first time by Decaisne, in his monograph of the Asclepiadeae. [e]

Improved descriptions of both genera are found in Bentham and Hooker's Genera Plantarum, [f] the comparison of which shows that the real distinction between the two is very small, but none the less so well marked that a confusion should not be possible. In Enslenia, namely, the corolla is bell-shaped, with the lobes more or less connivent; the scales of the corona are parted from the base—or, we should

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[a] Hist. Pl. **10:** 136. 1891.
[b] Pl. Hartw. 290. 1848.
[c] Gen. Pl. **1:** 164. 1818.
[d] Fl. Columb. **2:** *pl. 162.* 1862–69.
[e] In DC. Prodr. **8:** 516. 1844.
[f] **2:** 757 and 762.

say, very indistinctly connected at the base—and, if we adopt Nuttall's definition, "each terminated by two central filaments";[a] lastly, the stigma is obtusely conical and more or less distinctly bilobate. In Roulinia, the corolla is rotate, with reflexed lobes, and the scales of the crown are distinctly connate at the base, ending with a long, single appendage;[b] the stigma is depressed, with a scarcely conspicuous apex.

Now, the features that constitute the special characters of Enslenia are met with so far only in *Enslenia albida* Nutt. and *E. volubilis* Karst., some details of the floral structure of which are reproduced here after Karsten (fig. 17). As to *E. ligulata* Benth., the description agrees decidedly better with that of a Roulinia. It is true that the corolla is said to be campanulate, but this term can easily be applied to a rotate corolla in its first opening stage, just as the lobes of a campanulate corolla may be reflexed so as to give it a rotate appearance in a late stage of development. On the other hand, the scales

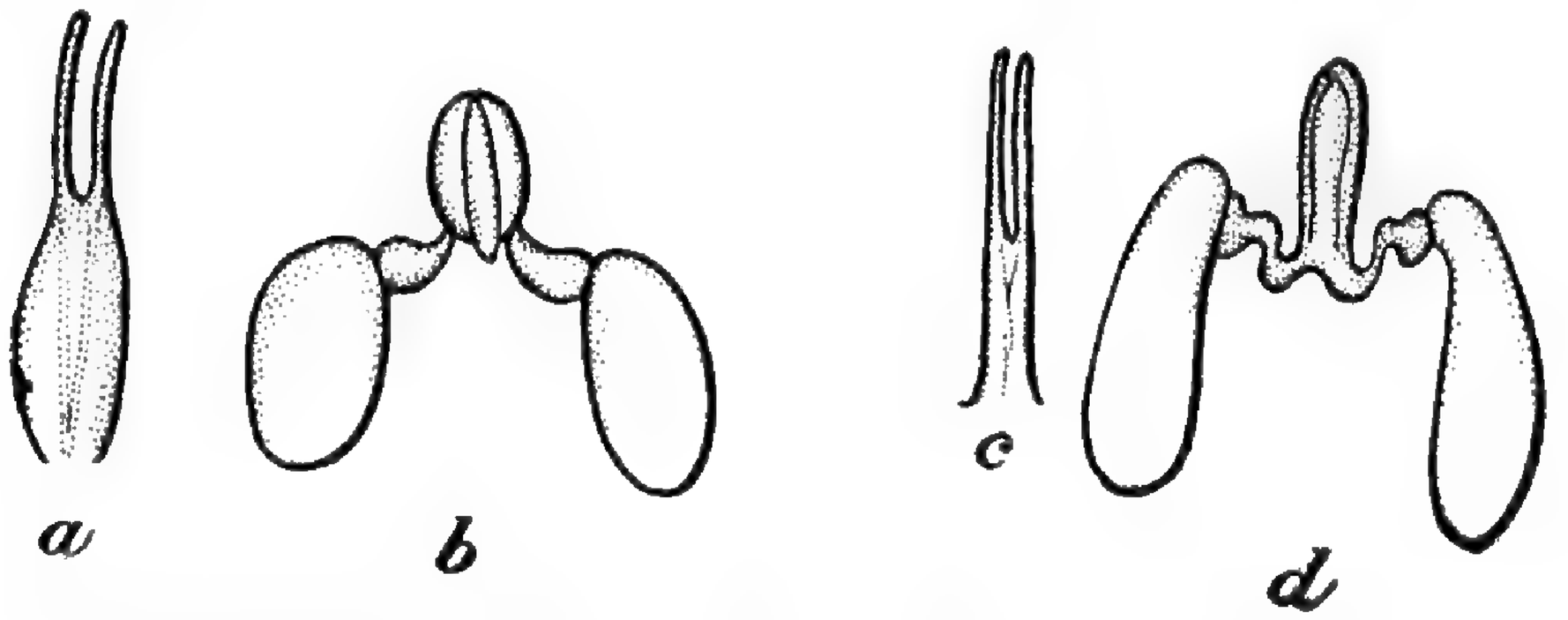



FIG. 17.—Flower parts of *Enslenia albida* and *E. volubilis*. Of former, *a*, segment of corona; *b*, translatorium Of latter, *c*, segment of corona; *d*, translatorium. *a*, *c*, Scale 18; *b*, *d*, scale 64.

of the corona are described as "briefly connate at the base," and divided into 3 lobules, the lateral ones very short and obtuse, the middle one (single) protracted in a long, lanceolate tip; the stigma is pulvinate (but not conical nor bifid), umbilicate, and obscurely pentagonal.

Bentham's description applies quite well to specimen no. 11021 of Pringle, collected at Yautepec in the State of Morelos, Central Mexico, the only noticeable difference being that the elongate rachis of the raceme often bears more than 3 flowers (3 to 6) at a time, and that the dimensions of the several parts of these are much less. But as to these dimensions there is evidently a mistake, for a corolla 7

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[a] The Genera reads (loc. cit.): "Corona squamae 5, basi tubi staminei affixae, erectae, latae, membranaceae, apice subtruncatae et medio in ligulam integram 2-fidam v. duplicem productae." The interpolation of the word "integram" is evidently intended to insure the place of *Enslenia? ligulata* Bentham, but is also an unjustified swerving from one of Nuttall's best characteristics of his genus.

[b] The original description of Decaisne (loc. cit.): "Foliolis ovato-rotundis crassiusculis in acumen erectum arcuatum v. inflexum v. *bifidum* desinentibus" is not supported, as to the italicized word, by his further diagnoses of 11 species.

lines, or nearly 1.5 cm. long, would be quite exceptional for either an Enslenia or a Roulinia. We find the calyx to be 2.5 to 3 mm. long, the corolla 5 to 5.5 mm., the corona segments from 3.5 to 4 mm. With these insignificant exceptions, and on the strength of Bentham's own description, I feel justified in transferring Hartweg's plant to the genus Roulinia, forming the combination **Roulinia ligulata** (Benth.) Pittier (fig. 9, p. 101).

The following details further supplement Bentham's description: Retinaculum 9.34 mm. long, 0.13 mm. broad; caudicles about 9.15 mm. long, rather thick; pollinia 0.35 mm. long, 0.18 mm. in diameter, ovate.

In her "Notes on the Genus Rouliniella," published 1902[a], Miss Anna Murray Vail seems to have disposed satisfactorily of the Mexican and a few South American species of this genus. The same botanist also identifies no. 6349, Donnell Smith, with *Roulinia racemosa* Kuntze; but this determination is very doubtful, because our plant does not quite agree with Jacquin's somewhat vague description, nor with the illustrations given in the mentioned paper by Miss Vail. The first might apply as well to *Rouliniella columbiana* Vail, on account of the following very clear reference to the segments of the corona: "Nectaria quinque, erecta, longitudine calycis, ovata, plana, *apice trilaciniato et acuminato*," and of this other one referring to the lobules of the corolla: "laciniis lanceolatis, planis, patentissimis, . . . *calyce paulo longioribus.*" Moreover, Jacquin's type was collected on the hill of La Popa near Cartagena, while Miss Vail's (Herbert H. Smith, no. 1668) proceeds from Honda, localities relatively close together and both situated in the lower, warm region of Colombia.

As to the use of Rouliniella advocated by Miss Vail in lieu of the old Roulinia, we simply note that it is not sanctioned by Dalla Torre and Harms.

## THE SPECIES OF OXYPETALUM OF THE CORDIFOLIUM GROUP.

In his masterly monograph of the Brazilian Oxypetala,[b] Dr. G. O. Malme established a new systematic division of the genus, into two subgenera and seven sections, founded first on the structure and dimensions of the translators and then on the characters of the leaflets of the corona and their appendages. The following notes refer to a few species, new or not specially mentioned by Dr. Malme.

Three species of Oxypetalum have been so far described and cited as occurring in western Colombia, Central America, or the West Indies. They are *O.* (*Gothofreda*) *cordifolium* (Vent.), *O. riparium*

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[a] Bull. Torr. Club **29**: 662–668.

[b] In "Die Asclepiadaceae des Regnellschen Herbars," Svensk. Vet. Akad. Handl. **34**: 7. 1901. See also Öfv. Vet. Akad. Förh. **57**: 843–865. 1900: Die systematische Gliederung der Gattung Oxypetalum R. Br., by the same author.

H. B. K., and *O. lindenianum* Turcz., the first two names being generally considered as synonyms. In addition to these, one species from Colombia is here described for the first time and probably two more have been confounded under one of the former names. All these species belong to the subgenus Euoxypetalum (Decaisne) Malme, characterized by broad, almost horizontal caudicles and by each caudicle being provided with a lateral, more or less excurved hornlet.

The first difficulty in classifying these species is as to their place in the five sections established by Malme. The fundamental characters made use of here are the dimensions and form of the retinaculum, the form and coherence of the crown leaflets, and the presence or absence of a horn-like appendage on the inner face of the latter.

So far as the first two groups of these characters are concerned, we are very well satisfied that the enumerated species all belong to the section Odontostemma Malme. We remain in doubt, however, when it comes to the last, which may be the fundamental, distinction on which the section is based, viz, the presence on the inner face of each crown leaflet of a more or less free, horn-like appendage.

This appendage is clearly indicated in Ventenat's description of his *Gothofreda cordifolia*[a] and in figure 6 of the accompanying plate. No appendage is mentioned in Kunth's description of the corona of *Oxypetalum riparium* H. B. K.,[b] whence most of the later authors have concluded to its absence. Turczaninow is silent as to this detail in describing his *O. lindenianum*. All the Costa Rican and Guatemalan specimens and my own from Colombia, are appendiculate, while the Cuban ones are not so.

With reference then to the presence or absence of the appendage on the leaflets of the corona, *O. cordifolium*, together with the plant collected by me in the Paez Valley and with the Central American species, would belong to section 3, Odontostemma Malme, while *O. riparium* and the Cuban specimens should be placed in section 4, Rhipidostemma Malme. The place of *O. lindenianum* remains doubtful.

Notwithstanding the opinion of several authors, beginning with Roemer and Schultes,[c] as to the identity of *Oxypetalum riparium* and *O. cordifolium*, I believe that they are distinct species. First of all, as above stated, they belong to different sections by one of the essential characters upon which the subdivisions of the genus are founded.

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[a] Ecailles . . . munies vers leur base interne de deux glandes entre lesquelles s'élève un corps cylindrique et courbé en dedans. Ventenat, Choix Pl. Cels 60 (au revers). 1803.

[b] Corona pentaphylla . . . ; foliolis cum laciniis corollae alternantibus, cuneatis, apice dilatatis, obliquis et emarginatis aut bilobis, crenulatis, carnosis, margine tenuioribus, basi ad utrumque latus gibbosis; gibbis rotundatis.—H. B. K. Nov. Gen. & Sp. **3**: 198. 1818.

[c] Syst. Veg. **6**: 92. 1820.

Besides this, their habit is not exactly the same, the first plant being voluble and more or less spreading, whereas in *O. cordifolium* the stems are ligneous, almost straight and simply climbing, with erect branchlets. The leaves are decidedly heart-shaped in *O. cordifolium*, this detail being so marked as to have suggested the specific name, whereas they are lanceolate in *O. riparium*. The inflorescences of this latter species are prevailingly axillary, whereas they are more slender and elongate, and often terminal in the first. The shape of the crown leaflets is not the same in both species, and lastly, they proceed from distant localities, *O. cordifolium* from Bogotá and *O. riparium* from Western Colombia, the altitudes being 2,600 and 2,000 meters, respectively.

If there is only one West Indian species, its identity with *O. riparium* is very doubtful. Six flowers of Wright's no. 406 from Cuba, showed uniform characters and the leaflets of the crown would be defined as "late cuneatis, apice flabellatis distincte trilobatis," whereas Kunth describes the same part of his species as "cuneatis apice dilatatis obliquis emarginatis aut bilobis, crenulatis . . . " a definition well exemplified in the drawings given in plate 231 of the cited work.[a] The Cuban plant also differs in a few other details, and moreover it is unlikely that a purely Andean species would appear again near the sea level in the Northern West Indies.

In conclusion as to these two points it seems reasonable to admit: First, that *Oxypetalum cordifolium* (Vent.), not Schlechter and *O. riparium* H. B. K. are distinct species and, second, that *O. riparium* Kunth bears no relation to the Antillean species. I do not intend, however, to insist here on this last proposition.

Of *O. lindenianum* Turcz. we can only say that its description is too incomplete to admit of its being correctly placed among the other species. Its apparent connections are with *O. riparium* Kunth, and it differs by several good characters from the new *O. huilense* Pittier.

After much hesitation I have come to the conclusion that the form collected in Costa Rica under no. 10826 (Instituto fís.-geog. Costa Rica) corresponds to *Gothofreda cordifolia* Vent., which thus becomes *Oxypetalum cordifolium* (Vent.) Schlechter, but exclusive of *O. riparium* Kunth and of the Antillean species. This species is carefully redescribed hereafter, and the Guatemalan specimens distributed by Captain Donnell-Smith are referred to it.

Aside from the type station, as given by Kunth, *Oxypetalum riparium* is indicated in two localities of the State of Vera Cruz in Mexico. Until the original specimens have been examined anew or new materials collected, it is not possible to decide whether this Mexican form belongs to the Cuban or to the Central American species.

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[a] See note *b*, p. 112.

The three identified species at present known to occur in Colombia and Central America can be distinguished by means of the following key:

Corona leaflets inappendiculate ..... *O. riparium.*
Corona leaflets appendiculate:
  Membrane of the anthers rounded at tip ..... *O. cordifolium.*
  Membrane of the anthers bilobate at tip ..... *O. huilense.*

**Oxypetalum cordifolium** (Vent.) Schlechter in Urban, Symb. Antill. 1:269. 1899 (excl. syn. *O. riparium* Kunth et sp. Antill.) FIGURES 18, 19, 20.

A climbing, ligneous vine with erect, axillary, pubescent branchlets.

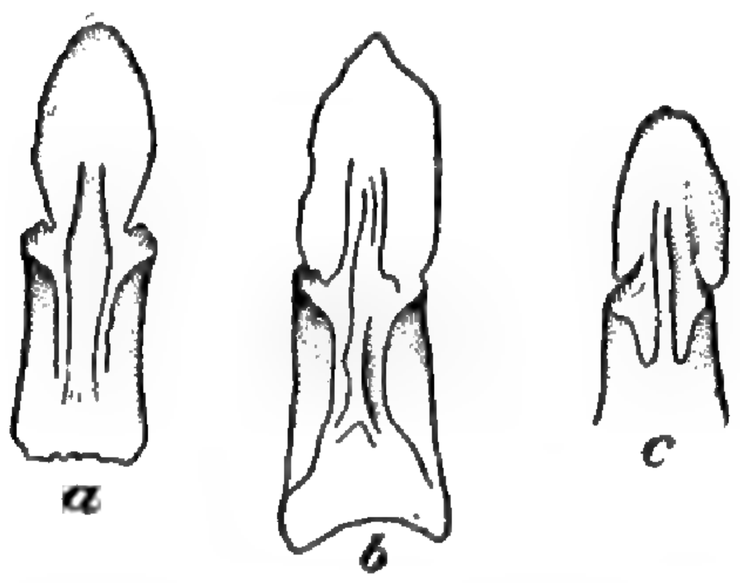



FIG. 18.—Stamens of *Oxypetalum cordifolium*. *a*, From no. 10862, Instituto fís.-geog. Costa Rica; *b*, from no. 12308, herb. cit.; *c*, from no. 4000, Donnell Smith Herbarium. *a–c*, Scale 9.

Leaves opposite, rather variable in size, petiolate. Petioles slender, hairy, 2.5 to 6 cm. long. Leaf blades broadly cordate-acuminate, 5 to 12 cm. long, 3 to 9 cm. broad, palminerve; upper face sparsely hairy, lower face stiff-hairy and paler.

Inflorescence few-flowered, erect. Peduncles hairy, 5.7 cm. long; pedicels densely hairy, shorter than the petioles. Calyx divisions hairy, linear, 2 to 3 mm. long. Corolla claret-purple, hairy outside, smooth inside, the lobes linear, about 18 to 27 mm. long, 2 mm. broad at the base, narrowing into an acute apex. Leaflets of the corona 2.5 to 3.3 mm. long, exceeding the stamens, appendiculate, broadly flabellate, or cuneate and rather narrow in their lower part and then with the tips obtusely pointed, subtrilobulate or distinctly trilobulate; appendage about 2 mm. long, shorter than the stamens. Stamens 2.8 mm. long, rather narrow, with an ovate-elliptic membrane 1 to 1.5 mm. long and rounded at the tip. Retinacles rather large, about 1.25 mm. long, the caudicles bearing a pair of laterally recurved hornlets; pollinia about 0.93 mm. long. Stigmatic head smooth, divided into two pointed branches about 3.5 mm. long.

Follicles not known.

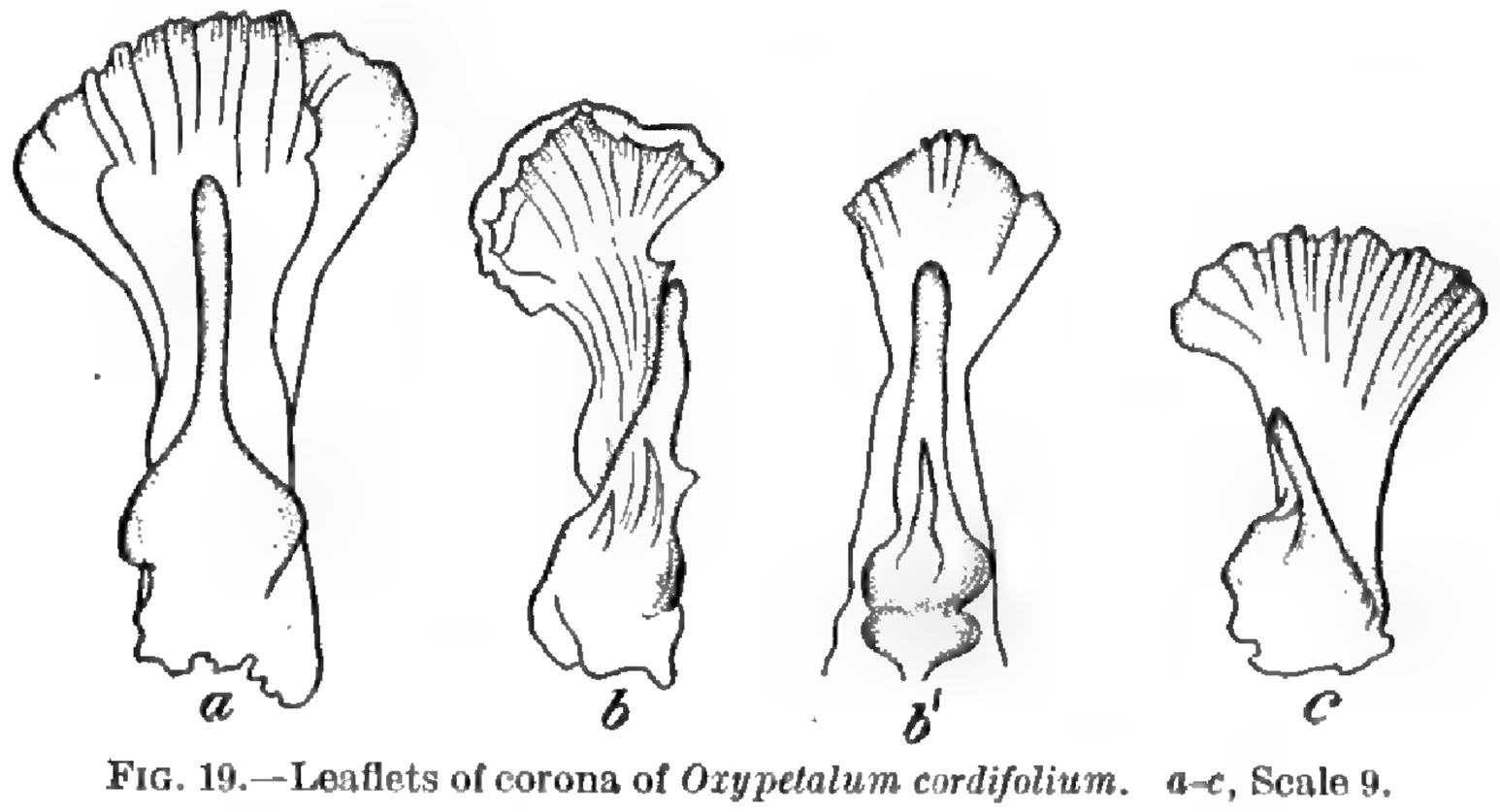



FIG. 19.—Leaflets of corona of *Oxypetalum cordifolium*. *a–c*, Scale 9.

COSTA RICA: San Pedro de la Calabaza, near Alajuela, altitude 1,100 meters; *Tonduz*, flowers, October, 1896 (Instituto fís.-geog. Costa Rica no. 10862; U. S. National Herbarium no. 577368); Atenas, on bushes along road, altitude 710 meters, *Pittier*, flowers, April, 1898 (Instituto fís.-geog. Costa Rica no. 12388; U. S. National Herbarium 577583).

GUATEMALA: Ojo de Agua, Departamento de Santa Rosa, altitude 1,170 meters, *Heyde & Lux*, flowers, September, 1892 (Donnell-Smith Herbarium no. 4000; U. S. National Herbarium no. 248281, distributed under the name of *O. riparium* Kunth).

All Central American specimens contained in the U. S. National Herbarium are here included under the name of *O. cordifolium* (Vent.) Schlechter, but there are certainly striking differences in their minor details, and were it not for a decided reluctance

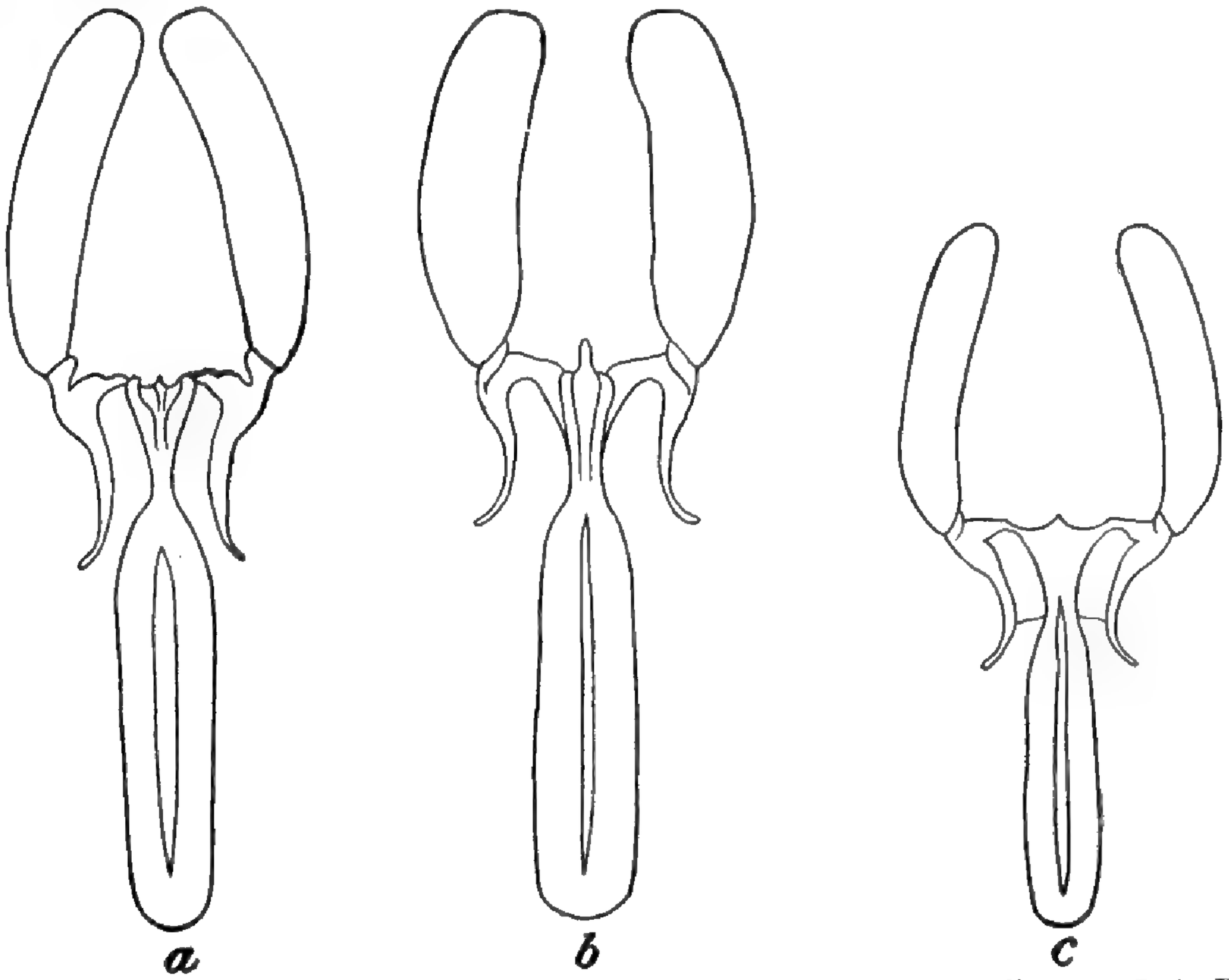



FIG. 20.—Translatoria of *Oxypetalum cordifolium*. *a*, From no. 10862, Instituto fís.-geog. Costa Rica; *b*, from no. 12388, herb. cit.; *c*, no. 4000, Donnell Smith Herbarium. *a*, *b*, *c*, Scale 32.

to founding new species on scanty material and the impossibility of comparing these at present with the types existing in other collections, one would feel inclined to separate them. Thus there is no small divergence in the form of the leaves, these being typically heart-shaped and large in nos. 577368 (Costa Rica) and 207252 (Guatemala), and rather cordiform-lanceolate and small in nos. 243231 (Guatemala) and 577583 (Costa Rica). While the calyx and the corolla show little variation, the leaflets of the corona differ widely in form and size from one specimen to the other, as shown in fig. 19, the only constant feature being the inside finger-like appendage with bituberculate base. There is, furthermore, a general and seemingly constant difference in the dimensions of all floral organs, the San Pedro plant showing maxima, the Guatemalan one minima, while the Atenas plant comes between them.

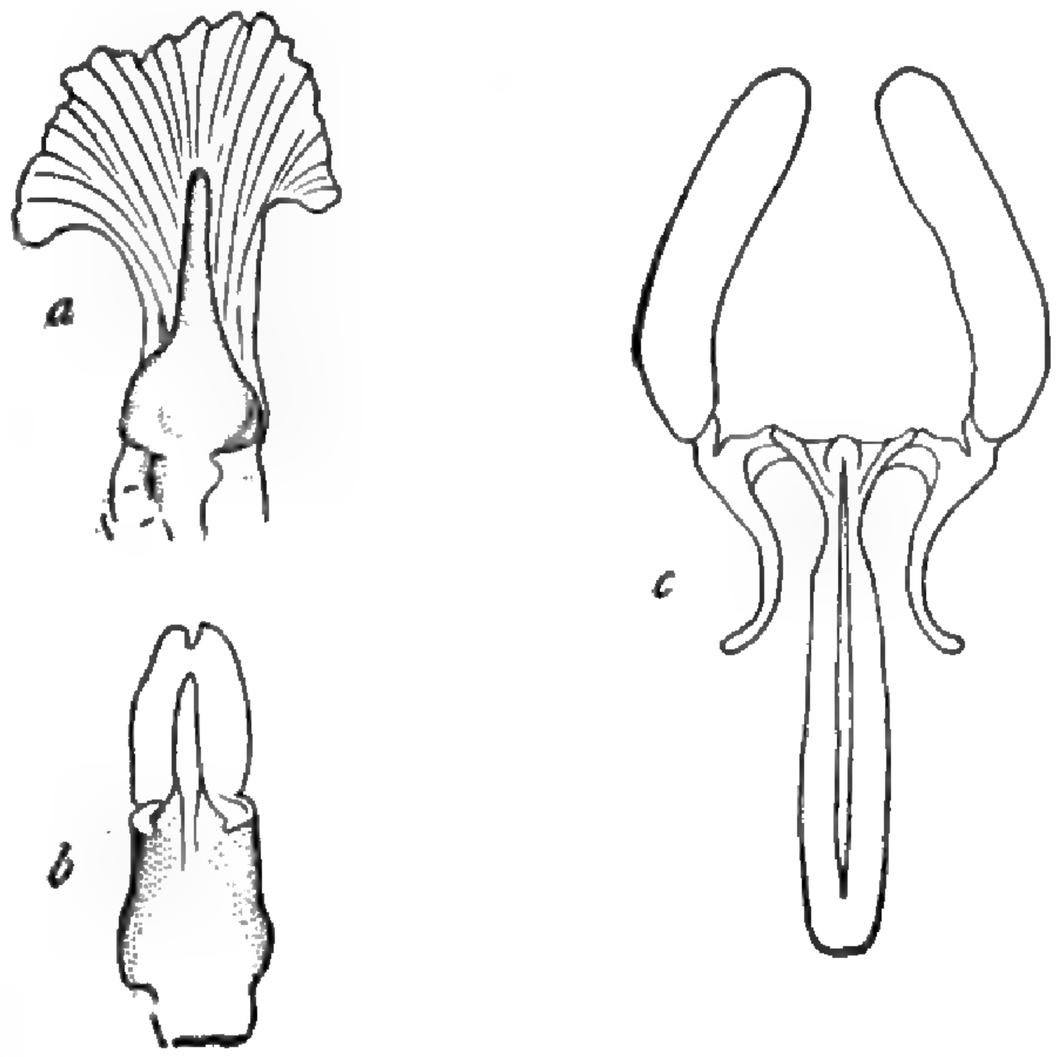



FIG. 21.—Flower parts of *Oxypetalum huilense*. *a*, Foliole of corona; *b*, stamen; *c*, translatorium. *a*, *b*, Scale 9; *c*, scale 32.

**Oxypetalum huilense** Pittier, sp. nov. FIGURE 21.

A voluble, milky vine, with subligneous, slender, sparsely ramified stems, smooth and finely striate on the older part, pubescent in the younger ones.

Leaves opposite, petiolate, rather small. Petioles slender, 1.5 to 2 cm. long, pubescent. Leaf blades 4 to 6 cm. long, 1.8 to 2.5 cm. broad, lanceolate or narrowly ovate-

lanceolate, cordate, with a broad, rounded sinus, long-acuminate, sparsely hirsute on the upper face, stiff-tomentose and papillose underneath.

Inflorescences axillary, few (1 or 2?) -flowered. Peduncles pubescent, as long as or longer than the petioles; pedicels 1 to 1.5 cm. long, provided at the base with hairy linear bracts 1 to 2 mm. long. Flowers greenish or purplish yellow. Sepals linear, 2 to 2.5 mm. long, acute, hairy. Corolla hairy outside, glabrous inside, with linear lobes about 1.5 cm. long. Folioles of the corona flabellate, about 3 mm. long, with a broad base, sinuate at the rounded tip and provided inside with an appendage of about the same length as the stamens, broadly rounded at the base and attenuate at the tip into a narrow point. Stamens 2 to 2.5 mm. long and rather broad, with the terminal membrane distinctly bilobate. Retinaculum about 0.92 mm. long; caudiculæ with 2 prominent lyrate hornlets; pollinia about 0.75 mm. long. Stigmatic head smooth, rather thick, dividing into two branches, slightly incurved and about 3.5 mm. long.

Peduncles and pedicels of the follicles elongated at maturity (peduncle 3 cm., pedicel 2 cm.).

Follicles fusiform, 8 to 8.5 cm. long, smooth outside. Seeds 8.9 mm. long, fixed along longitudinal sinuate wings of a central placenta, flat, cuneiform, strigose-verruculose on both faces, irregularly dented at the broader end and with the usual hair tuft at the other end.

COLOMBIA: Around the Indian village of Huila in the Rio Paez Valley, Tierra Adentro, Cauca, altitude 1,800 meters, *Pittier* 1231, flowers and fruit, January 31, 1906 (U. S. National Herbarium no. 531476, type).

## SOLANACEAE.

### TWO NEW SPECIES OF CYPHOMANDRA FROM COLOMBIA.

**Cyphomandra dendroidea** Pittier, sp. nov. FIGURE 22.

Small tree, 3 to 4 meters high, with divaricate limbs, entirely glabrous except the younger leaves, which are slightly pubescent, and the woolly tips of the corolla.

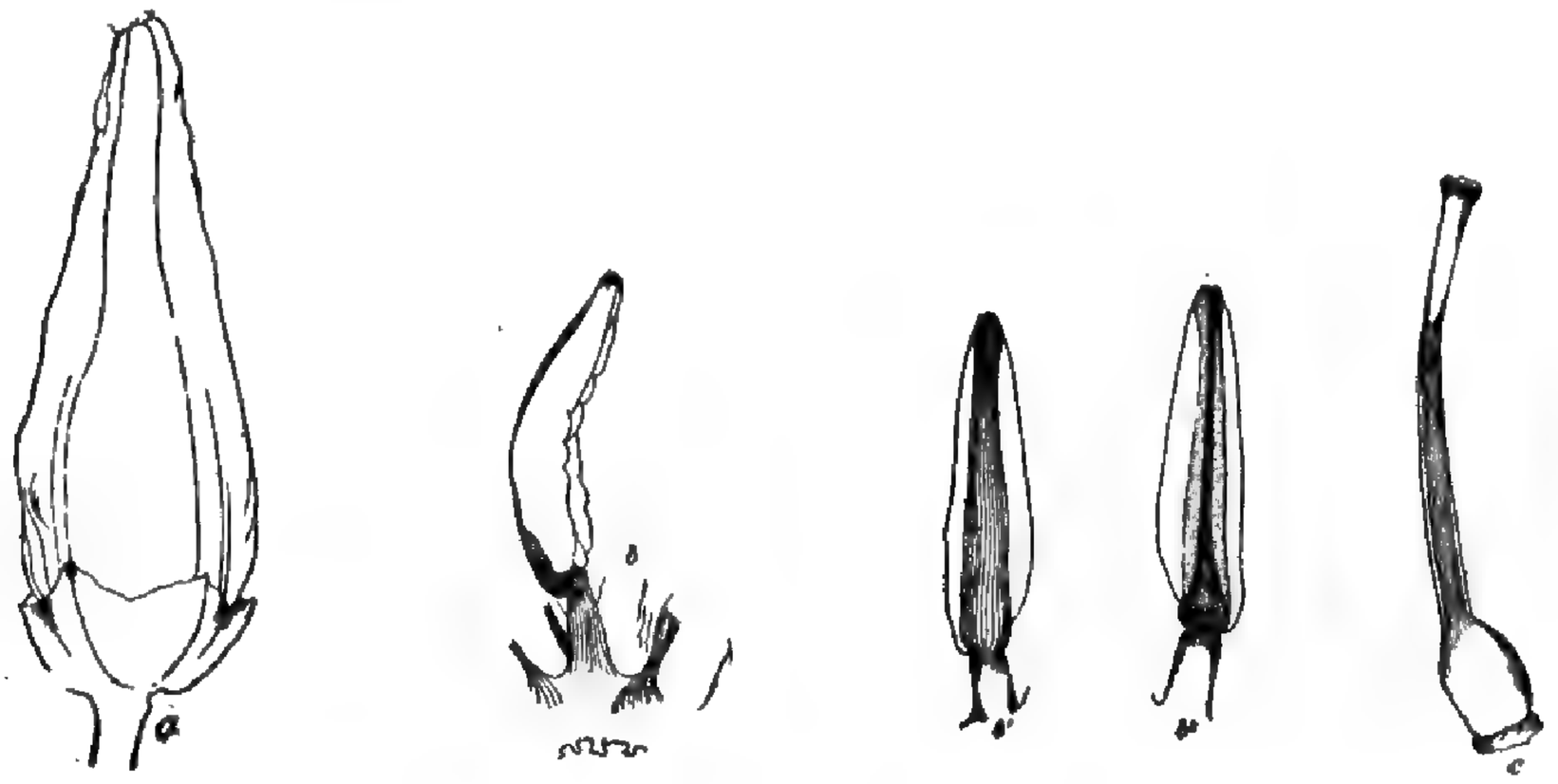
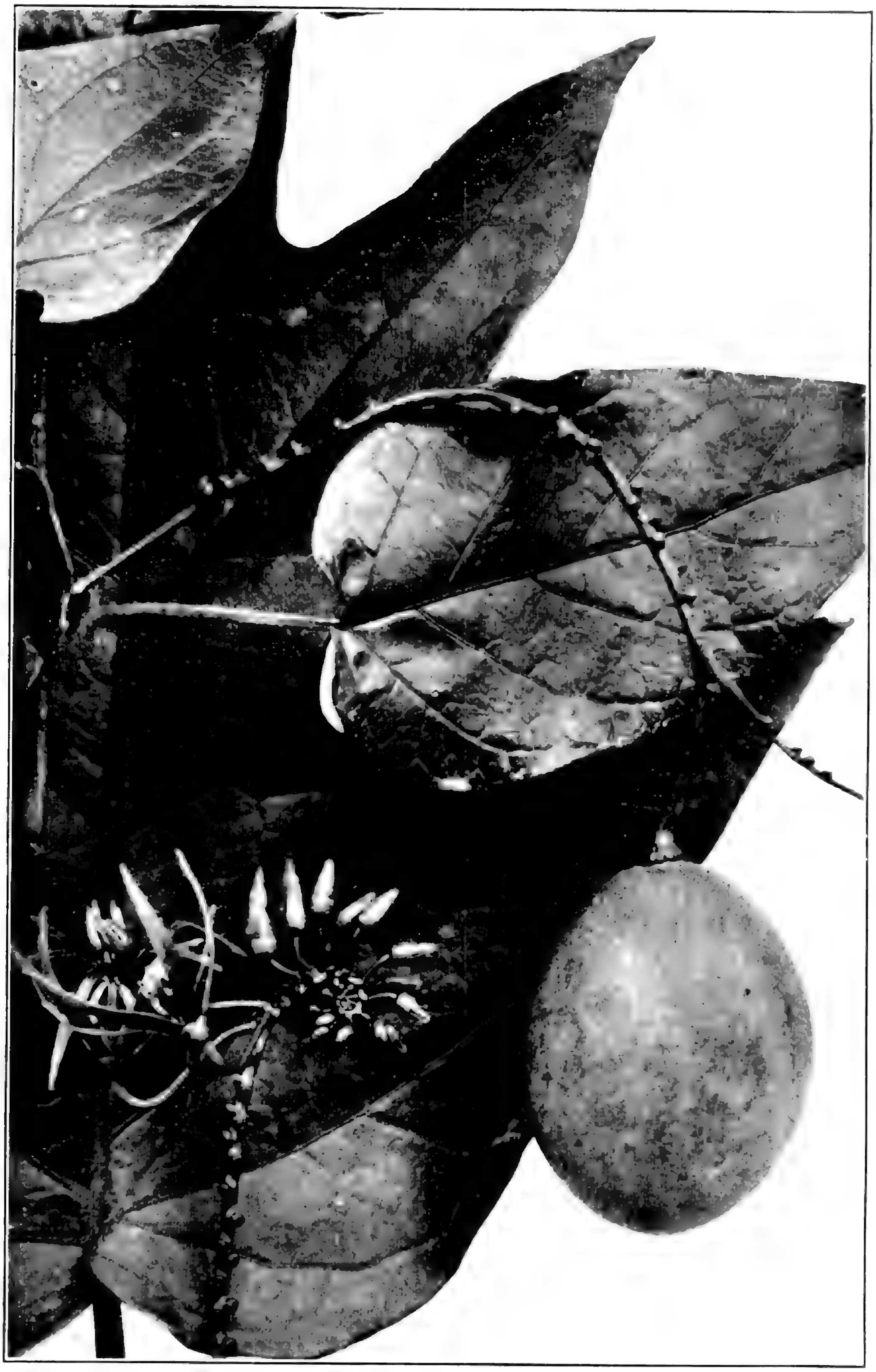



FIG. 22.—Flower bud and flower parts of *Cyphomandra dendroidea*. *a*, Flower before anthesis; *b*, side view of stamen; $b^1$, back or outside view and $b^2$ front or inside view of stamen; *c*, pistil. *a*–*c*, Scales slightly under 6.

Leaves all simple. Petioles 1.5 to 3.5 cm. long. Leaf blades 3 to 13 cm. long, 6 to 11 cm. broad, asymmetric, cordate or subcordate at base, broadly ovate-acuminate, dark green and almost glossy above, paler or brownish below.

Racemes axillary, dichotomous. Peduncles 6 to 8 cm. long; rachis 10 to 12 cm. long, with the scars of the pedicels scarcely salient. Pedicels 2 to 3 cm. long. Calyx 6 mm. deep, coriaceous, irregularly 5-lobed; the sinuses about 2 mm. deep, the lobes ending in an obtuse, ciliate apex. Corolla 22 to 23 mm. long, deeply cleft (tube about 2 mm. long), greenish; lobes 20 to 21 mm. long, 2.5 to 3 mm. broad at base, long-lanceolate, acuminate, woolly at tips. Stamens erect; filaments 1.8 to 2.2 mm. long; anthers



CYPHOMANDRA NARANJILLA PITTIER.

about 7 mm. long; connectives brown, very thick, with the pale yellow cells attached laterally on the ventral or inside face. Pistil about 11.5 mm. long; ovary ovoid, 2.5 mm. long; style filiform, 8 to 10 mm. long, slightly clavate. Fruits spherical, 4 cm. in diameter, yellow, hanging 2 or 3 together at end of rachis.

COLOMBIA: Margin of the forest at Córdoba, Dagua Valley, at about 60 meters above sea level, in the rain belt of the Pacific Coast, flowers and fruits, December 7, 1905, *Pittier* 512.

At first this species was referred to the little known Peruvian *C. obliqua* Sendtn., on account of the decided similarity of our specimens to figure *a*, plate CLXV, volume 2, of Ruiz & Pavon's Flora Peruviana. The plant from Córdoba, however, is not suffruticose but decidedly ligneous and growing to the size of a small tree; the inflorescence is dichotomous, the corolla greenish with woolly tips, the stamens much longer and more slender than in *C. obliqua*, and the berries quite round. *C. arborea* seems to belong in § 2, * * * of Sendtner's systematic arrangement,[a] but is quite distinct from any of the species included therein.

**Cyphomandra naranjilla** Pittier, sp. nov. PLATE 17. FIGURE 23.

A small tree, 2 to 3 meters high. Trunk straight, erect. Branchlets dichotomous, almost horizontal or pendulous.

Leaves dimorphic, the cauline or basal ones 5-lobate, the terminal ones, on the branchlets, simple. Basal leaves: petioles thick, 10 to 12 cm. long; blades cordate at base, 24 cm. long, 23 cm. broad, the broad interlobular sinuses reaching two-thirds of the half breadth; lobes lanceolate, acuminate; upper face glabrous, dark green; lower face paler, finely granulate. Terminal leaves: petioles slender, 2 to 4 cm. long, finely granular-pubescent; blades coriaceous, 12 cm. long, 5 cm. broad, ovate-lanceolate, cordate or subcordate, long-acuminate.

Cymes scorpioid, simple, elongate (15 to 25 cm. long), glabrous. Flowers very numerous, caducous, the scars of the pedicels being very prominent on the rachis. Pedicels 1.5 to 2.5 cm. long, slender, glabrous. Calyx urceolate or cupuliform, about 2.5 mm. deep, obscurely crenate, coriaceous. Corolla about 25 mm. in total length, sparsely hairy inside, purplish green; tube about 2 mm. long; lobes 23 mm. long, 2.5 to 3 mm. broad at base, long-lanceolate, acuminate, ciliate. Stamens erect; filaments 3 mm. long; anthers 7 to 8 mm. long, purplish yellow; terminal pores marked by a few diminute erect hairs. Pistil smooth; ovary rounded-conical, 3.5 mm. high; style filiform, elongate, 8 to 10 mm. long; stigma shortly clavate. Fruit egg-shaped, pendulous, yellowish green, the long diameter 5 cm., the short diameter 4 cm.



FIG. 23.—Stamen and pistil of *Cyphomandra naranjilla*. Scale about 3.

COLOMBIA: Growing wild in the mountains above Palmira and cultivated in the garden at La Manuelita, near the same town, Cauca Valley, altitude 1,200 to 1,800 meters. Our specimens are from the garden, *Pittier* 914, January 2, 1906 (U. S. National Herbarium no. 531106, type). The fruits, called *naranjillas*, are edible, very juicy, and with an agreeable, sweet, acidulate flavor.

This new species belongs to the group of heterophyllous Cyphomandrae, of which *C. pendula* Sendtn. and *C. heterophylla* Taub. are the South American types, while the group is represented in Central America by *C. costaricensis* Donnell Smith.

Sendtner[b] has partially described a considerable number of Colombian forms of this genus, but none of his descriptions seem to apply to our two new species.

EXPLANATION OF PLATE 17.—Leaves, flowers, and fruit. From a photograph taken by Mr. C. B. Doyle in the garden at La Manuelita.

[a] In Walp. Repert. Bot. **6**: 576–579. 1846–47.

[b] Loc. cit. 579.

## CUCURBITACEAE.

### A NEW SPECIES OF CAYAPONIA AND TWO OF ANGURIA.

**Cayaponia macrantha** Pittier, sp. nov.

Stems slender, sulcate, glabrous, slightly puberulent at the nodes, densely foliose; branchlets short and numerous.

Petioles sulcato-striate, 1.5 to 2 cm. long. Leaf blades ovate, 7 to 12 cm. long, 5 to 10 cm. broad, deeply trilobate, attenuate and slightly emarginate at base, dark and scabrous above, pale and minutely white-dotted beneath with a few elliptic glands near the petiole; margin remotely dentate; lateral main ribs not marginal at base; lobes ovate-lanceolate, the medium one longer, the lateral ones oblique and often bilobate. Tendrils simple or bifid.

Male flowers long-pedunculate, solitary in the axils. Peduncles erect, striate, 4 to 6 cm. long. Calyx campanulate, 1.8 cm. long and about 1.5 cm. broad, brownish, sparsely covered with multicellular hairs emerging from a bulb-like base; teeth remote, reflexed, acutely triangular, 3 to 5 mm. long. Corolla yellowish white, large (4 cm. long, nearly 5 cm. in diameter when open) tube woolly-pubescent inside; lobes ovate-rounded, 2 cm. long, about 1.5 cm. broad, covered on both faces with a dense velvety indument consisting of multicellular hairs. Filaments of stamens 5 mm. long, woolly; anthers coherent, forming an ovate-cylindrical head 13 to 14 mm. long and 4 mm. in diameter. Pistillodium thick, trilobate. Female flowers wanting.

Fruit large (about 5 cm. in diameter), round, yellow with green stripes. Seeds like a middle-sized bean, 13 mm. long, 7.5 mm. broad, compressed.

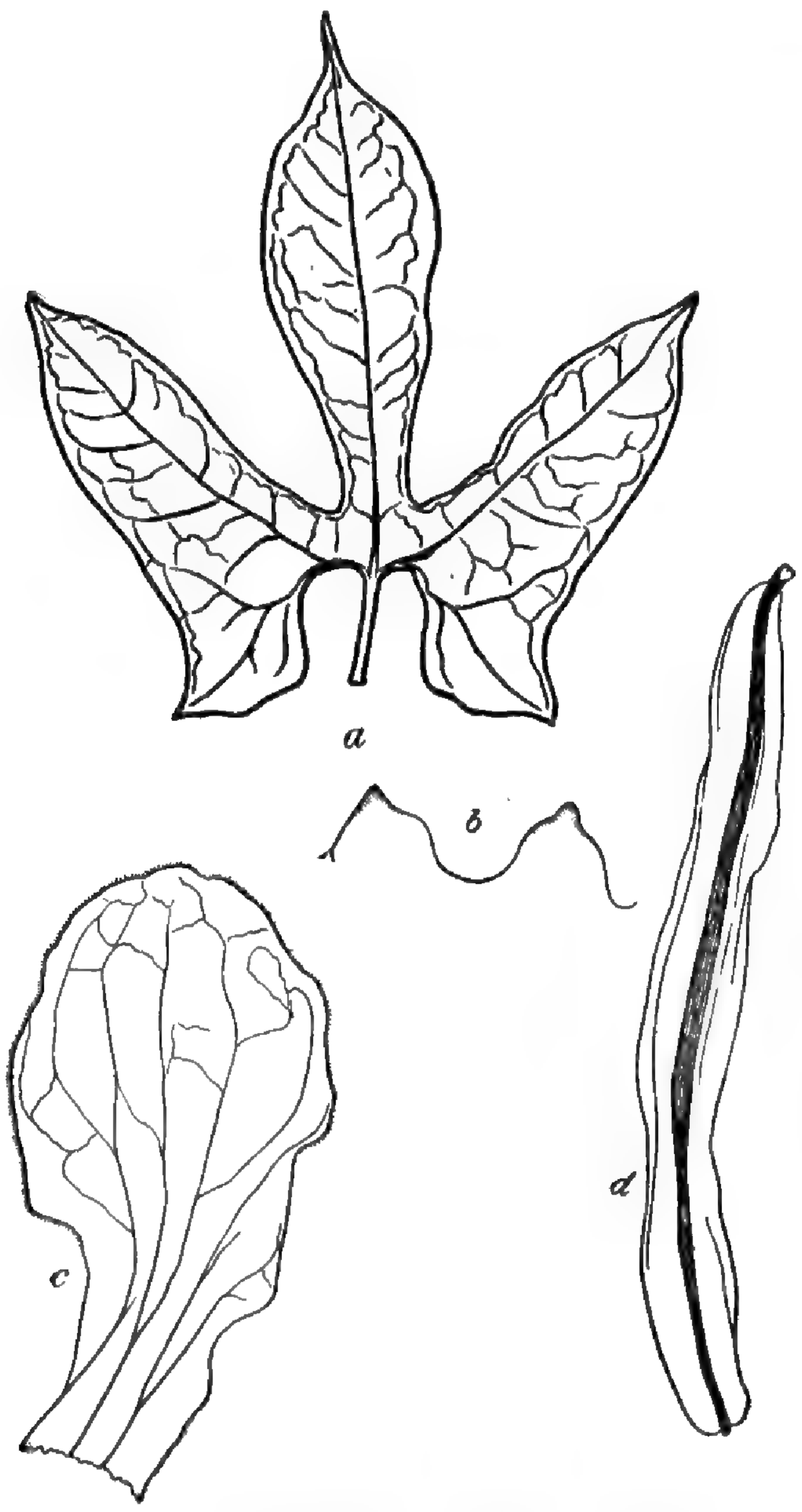



FIG. 24.—Leaf and flower parts of *Anguria magdalenae*. *a*, Leaf; *b*, part of calyx showing two teeth; *c*, lobe of corolla; *d*, stamen. *a*, Scale ¼; *b–d*, scale 6.

COSTA RICA: Climbing on bushes at Las Vueltas de Tucurrique, Reventazon Valley, at an altitude of about 635 meters, *Tonduz*, flowers and fruits, December, 1898 (Instituto fís.-geog. Costa Rica no. 12840; U. S. National Herbarium no. 577647, type).

**Anguria magdalenae** Pittier, sp. nov. FIGURE 24.

Plant entirely glabrous, except the papillose petals. Stems slender, rounded, longitudinally striate, smooth.

Leaves green and minutely punctate above, paler beneath, deeply emarginate at the base and deeply 3-lobate. Petioles rather strong, striate, 4 to 5 cm. long. Leaf

blades 14 to 18 cm. long, 14 to 16 cm. broad; basal sinus about 4 cm. deep and 5 cm. broad; lateral lobes broadly auriculate and more or less triangular-acuminate; middle lobe ovate-lanceolate, acuminate, narrower at the base; venation conspicuous on both sides, the lateral main nerves bifurcate and at first contiguous to the margin of the sinus. Tendrils rather slender.

Flowers middle-sized. Peduncles of the male inflorescence stout, more or less sulcate in dry specimens, smooth, 20 to 24 cm. long, and bearing a short spike of 5 to 15 sessile flowers. Tube of the calyx subcylindrical, slightly ventricose at the base, 10 to 12 mm. long, 3 mm. broad; teeth triangular, slightly contracted near the tip, 1 mm. long. Petals obovate, obtuse at the apex, sparsely papillose, red, 6 to 7 mm. long. Anthers linear, scarcely shorter than the tube of the calyx and about 1 mm. thick; appendage barely 0.3 mm. long, obtuse and not papillose.

Female flowers and fruits not known.

COLOMBIA: Around Rio Frío, between the Ciénega de Santa Marta and the foothills (State of Magdalena), altitude about 100 meters, *Pittier* 1630, male flowers, July 4, 1906 (U. S. National Herbarium no. 600066).

On account of its straight anthers with glabrous appendage, and its subspicate male inflorescence, this species should take place near *A. warscewiczii* Hook. and *A. pallida* Cogn., only that it differs from both by its simple 3-lobate leaves. By the coincidence of two of the above characters, viz, the glabrous appendage and 3-lobate leaves, our plant constitutes a new feature in the genus Anguria and along with the sessile flowers and the general glabrescence, these characters give sufficient ground for describing it as a new species.

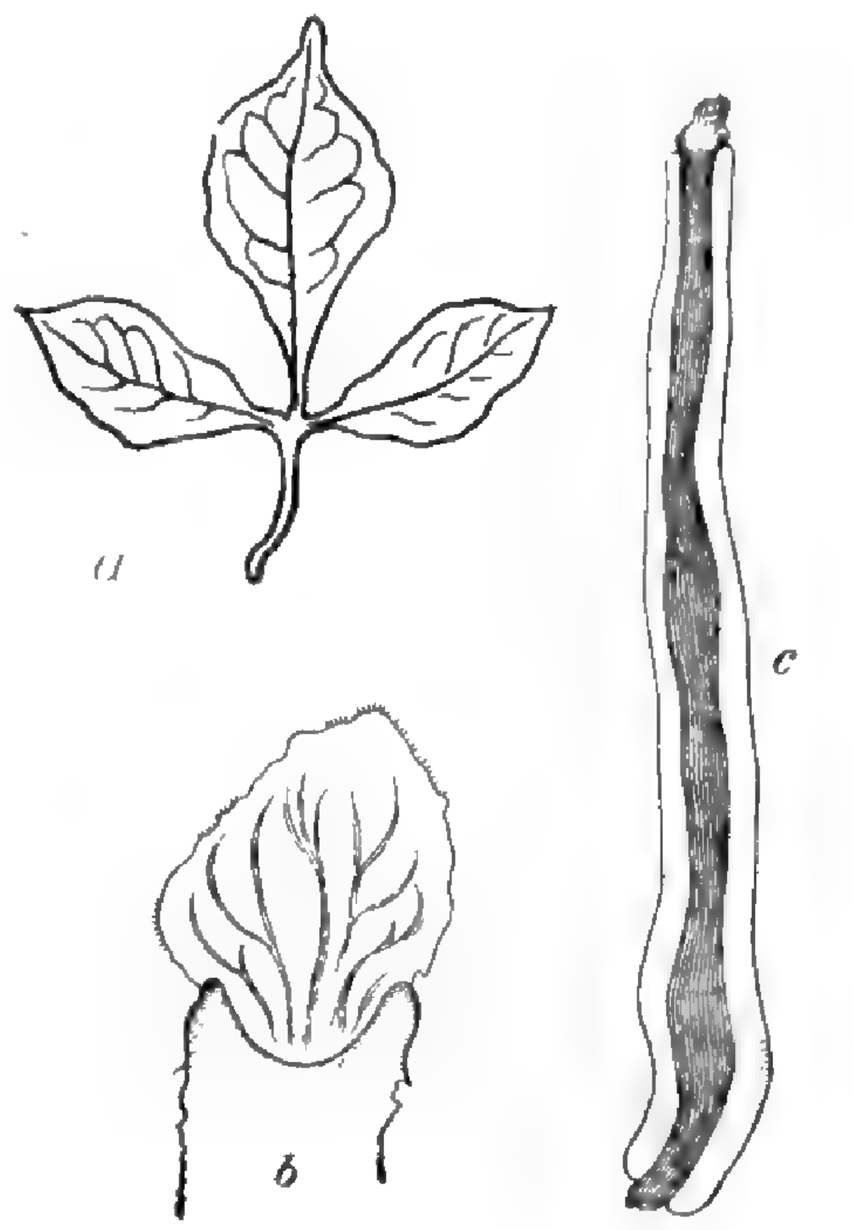



FIG. 25.—Leaf and flower parts of *Anguria limonensis*. *a*, Leaf; *b*, part of perianth showing two teeth of calyx and one segment of corolla; *c*, stamen. *a*, Scale ¼; *b*, *c*, scale 6.

FIGURE 25.

**Anguria limonensis** Pittier, sp. nov.

Stems slender, sulcate or angulose-striate, glabrous.

Leaves 3-foliolate. Petioles 3 to 4 cm. long, rather thick, subcanaliculate, pubescent; petiolules 5 to 10 mm. long. Leaflets ovate to lanceolate, more or less attenuate at the base, acuminate at the tips, glabrous, dark green above, paler beneath; nervation pinnate, scarcely prominent below; margin entire or obscurely sinuate; middle leaflet 8 to 15 cm. long, about 4 cm. broad, the lateral ones smaller, often asymmetrical and sublobate. Tendrils strong, terete, smooth.

Male flowers small, sessile or subsessile. Common peduncle 10 to 25 cm. long, deeply sulcate, bearing a short spike of 20 to 25 flowers. Calyx 8 to 10 mm. long, green, cylindrical and scarcely ventricose at the base, striate; teeth spreading, more or less subulate, 0.5 to 1 mm. long. Petals red, ovate, very briefly unguiculate, obtuse at the tip, hairy-papillose on both faces, 4 to 6 mm. long, 2 to 3 mm. broad. Stamens inserted on the tube of the calyx at the upper end of their lower half, linear, 7 to 9 mm. long, 1 mm. thick, with a very short (0.3 mm.), rounded, papillose appendage. Female flowers and fruits unknown.

COSTA RICA: Along the Caribbean coast between Port Limon and Moin, *Pittier*, male flowers only, September, 1899 (Instituto fís.-geogr. Costa Rica no. 16112).

This species is nearly related to *Anguria triphylla* Miquel, from which it differs mainly by the dimensions and a few other characters of the male flowers.

## THE COSTA RICAN SPECIES OF CYCLANTHERA AND SOME RELATED PLANTS.

The species of the genus Cyclanthera, and to a less extent those of the other genera considered here, are of interest to the economic botanist because the fruits, and sometimes the tender shoots, of several of them have been from the remotest time among the natives of Middle America and of Western South America favorite vegetables, and have been readily adopted by the Spanish-American race.

### CYCLANTHERA.

The edible fruits of Cyclanthera are called *caihuas* or *caigues* in Peru and Bolivia, *achocchas* in Ecuador, and *achuchas* in Western Colombia, all of which names are of Kitšua origin. In Costa Rica, the first term has become *caífa*, and in Guatemala *caíba;* and, as one of the species from which the edible fruits are derived extends as far north as Mexico, it is likely that they are used all over the area for the same purpose and have correspondingly received some native names. In a few instances, not only the fruits but also, as indicated above, the tender shoots, play a part in the native culinary art, in Costa Rica, such shoots being known as *quelites*, a general term derived from the Nahuatl *quelitl*, meaning "sprout" or "shoot."

The sources of the caifas or achuchas, as far as known, are *Cyclanthera pedata* and *C. tenuisepala* (fig. 26) in South America, *C. pedata* (pl. 13) and perhaps also *C. tonduzii* in Costa Rica, and in Guatemala *C. multifoliata*, the fruits and shoots of which Mr. O. F. Cook found in use at Purulhá. These four species are true Cyclantherae, characterized by the peculiar discoid structure of the single anther. *Cyclanthera pedata*, the generic type, is a very variable plant, and it is questionable whether *C. tenuisepala* is not the same species or at the most a subspecies, growing under special conditions, namely, in a wet climate or in shady places with rich soil, as can be inferred from the leafiness, size, and delicacy of the specimens at hand. According to the author's description, the main distinctive characteristics are in the thread-like calyx teeth of the male flower, longer than the corolla, and in the very small fruit. But it is found that the length of those teeth is variable in the three nearest related species of the group, and besides, it is very doubtful whether Mr. Cogniaux had a fully grown fruit at his disposal on which to found his description. The plant from which specimens were collected by Miguel Bang at Cochabamba (Plantæ bolivianæ no. 1260), the flower of which is here reproduced (fig. 26), is said to have been under cultivation, evidently for its fruits. Of these there is only one immature and smooth specimen, and that is over 2 cm. long and 9 mm. broad, that is to say, larger than the mature fruit should be according to the dimensions given in the original description. But again, the leaves of our specimens have mostly long petioles and large leaflets that

agree better with what is considered to be *C. pedata*. On the other hand, specimens of *C. pedata* in the National Herbarium, with short calycinal appendages and large fruits, are not otherwise distinguishable from the former. In both forms the fruit is either smooth or aculeate. *Cyclanthera pedata* grows in Costa Rica and Central America generally, but several of the National Herbarium specimens collected in that region and labeled as this species belong more likely to the nearly related *C. tonduzii*, which differs by its female flowers borne on rather long, stiff pedicels and with densely aculeate ovary, and also by the rounded fruits, rather dry, and always covered with rigid spines. The statement made in the "Plantas usuales de Costa Rica" by the present writer, that the *caífas* proceed from this plant, may be erroneous, as is the name under plate 13, which should read "*Elateriopsis oerstedii.*" Specimen no. 9787 of the Instituto físico-geografico (U. S. National Herbarium no. 471840), the only one originally labeled as *caífa*, was wrongly identified as *C. tonduzii;* it is certainly *C. pedata* and it came from San Rafael de Cartago, where it grows abundantly, covering at times the stone walls and bushy hedges that surround the truck gardens. That the identity of our *caífa* is as stated is confirmed by the fact that in the same neighborhood Oersted collected his nos. 58 and 60 (Copenhagen Herbarium) which, according to Mr. Cogniaux, belong to the same species. Nevertheless, it is not yet quite clear whether the tender young fruits of *C. tonduzii* are not likewise used as a vegetable. As only a short and incomplete diagnosis of this plant has been published, its full description is given below.

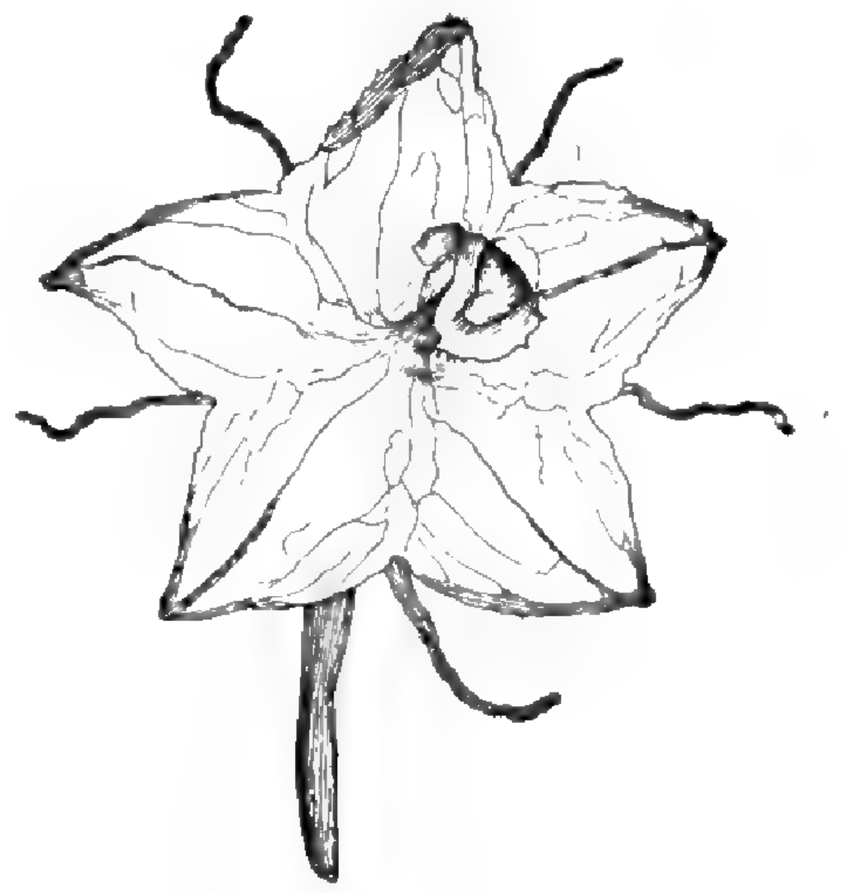


FIG. 26.—Male flower of *Cyclanthera tenuisepala*. Scale 6.

In addition to the above-mentioned species, four more have been so far reported from Costa Rica, of which it is not known whether the fruits or the tender shoots are used as articles of diet. We give below the distribution, general and special, of the six species, which can readily be distinguished by means of the following key:

KEY TO THE SPECIES.

Leaves pedate or digitate.
- Primary leaflets 5.
  - Fruits oblique, smooth or with soft spines only at base..... *C. pedata.*
  - Fruits almost straight, always echinate..... *C. tonduzii.*
- Primary leaflets 3.
  - Leaflets crenate or slightly lobate. Fruits with short peduncles..... *C. naudiniana.*
  - Leaflets dentate, the lateral ones often 3-lobate. Fruits with long peduncles..... *C. langaei.*

Leaves trilobate.

Lobes deeply cleft, ovate-lanceolate..... *C. costaricensis.*
Lobes less deep, triangulate..... *C. explodens.*

**1. Cyclanthera pedata** Schrad. Linnaea **8**: litt. 23. 1833. PLATE 18.

General distribution: along the South American Andes, from Bolivia to Panama, and in the mountainous region of Middle America, reaching to Central Mexico. Often cultivated for its edible fruits and shoots.

COSTA RICA: Near Cartago (Oersted nos. 59 and 60, in Copenhagen Herbarium); San Rafael de Cartago, altitude 1,450 meters, *Pittier*, flowers, November, 1895 (Instituto fís.-geog. Costa Rica no. 9787).

EXPLANATION OF PLATE 18.—Flowers, fruit, etc. From photographs taken at Calí, Cauca, Colombia, by C. B. Doyle and H. Pittier.

**2. Cyclanthera tonduzii** Cogn. Bull. Soc.Bot. Belg. **30**: 274. 1892.
FIGURES 27, 28, 34.

Ramis ad nodos brevissime puberulis caeteris glaberrimis, foliis longe petiolatis, palmato-5-foliolatis; foliolis supra tenuissime punctato-scabriusculis, subtus glaber-

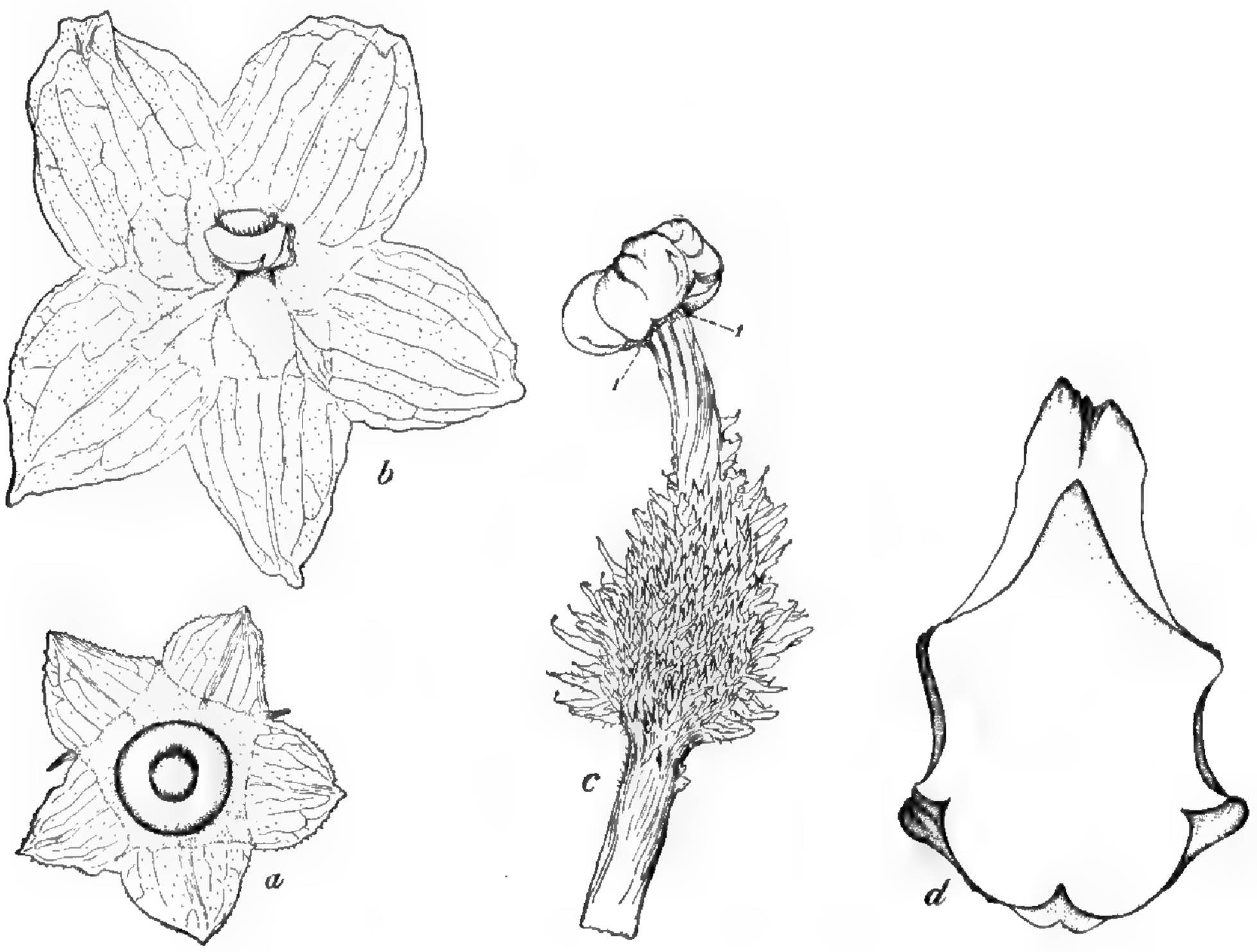



FIG. 27.—Parts of *Cyclanthera tonduzii*. *a*, Male flower, just open; *b*, full-grown flower; *c*, pistil (1, 1, insertion of calyx and corolla); *d*, seed. *a–d*, Scale 6.

rimis laevibusque, saepius profunde lobatis vel trisectis, segmentis obtusis terminali acuto; cirrhis bifidis; pedunculis communis masculis vix ramosis, foliis plerumque longioribus, floribus parvis, superne in fasciculos paucifloris subverticillatim ramulosos; calycis dentibus setaceis plus minusve longis; fructu breviter pedunculato, dense echinato, apice longe acuminato.—Cogniaux, loc. cit., emend.

Stems slender, angulose, little branched, smooth.

Leaves variable in size, texture, and subdivision of the lobes. Petioles 3 to 10 cm. long, slender, striate. Leaf blades 4 to 12 cm. long, 5 to 14 cm. broad, more or less punctate, light green above, paler beneath. Leaflets shortly petiolate, denticulate or subcrenate, the tips and teeth mucronate, the three middle leaflets more or less pinnate, the exterior ones almost always distinctly trilobate-auriculate. Tendrils bifid, rather slender and elongate.



CYCLANTHERA PEDATA SCHRAD.

Peduncles of the male inflorescence nude, angulose-striate, mostly longer than the leaves, the 20 to 30 flowers more or less congested in a few terminal fascicles. Pedicels capillary, 2 to 5 mm. long. Calyx glabrous, broadly spreading, about 3 mm. in diameter; teeth subulate-setaceous, 0.6 mm. long. Corolla white; segments ovate, more or less rounded at tip, about 2 mm. long, 1.5 to 2 mm. broad, more or less regularly 7-veined, pubescent, glandular or papillose. Staminal disk with a crown of papillose hairs around the connective. Pedicel of the female flower 1.5 to 2 mm. long. Calyx and corolla as in male flower. Ovary fusiform, rounded at base, echinate throughout except on the long terminal rostrum. Stigma sessile, rounded-depressed, sublobulate, 2 to 2.5 mm. broad, 1 mm. high.

Fruiting peduncle 2 to 3 cm. long. Fruit 2 to 2.5 cm. long, 1 to 1.5 cm. in diameter, densely covered with hard, hooked spines, many-seeded. Seeds elongate (5 to 6 mm. long, 3 to 4 mm. broad, 0.5 to 1 mm. thick), flattened, appendiculate at base, regularly sinuate on the margin, brown or yellowish brown, smooth.

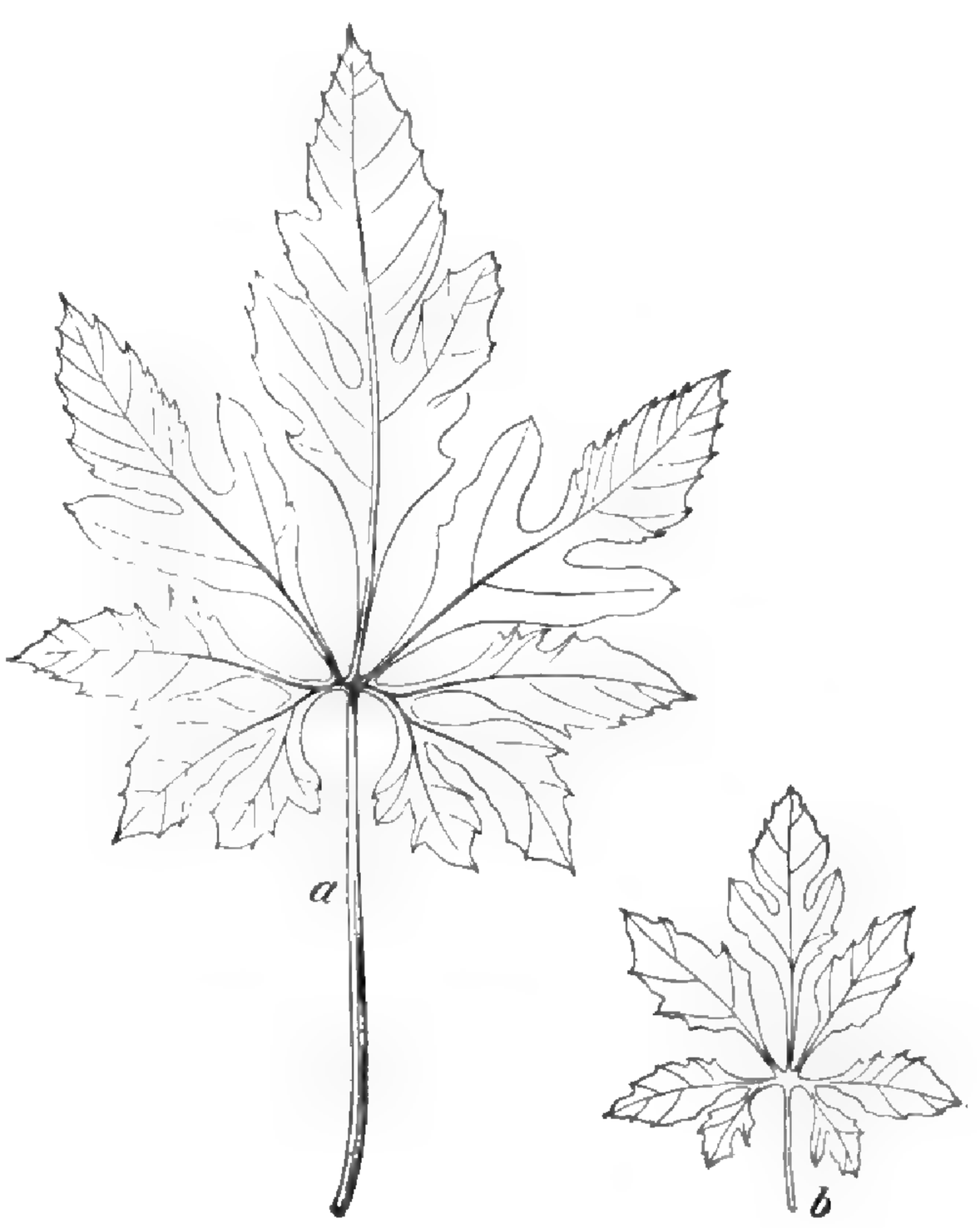



FIG. 28.—Leaves of *Cyclanthera tonduzii*. *a*, *b*, Extreme forms and sizes. Scale ⅓.

COSTA RICA: Hedges around San José, altitude 1,200 meters, *Tonduz*, flowers, November 28, 1889 (Instituto fís.-geog. Costa Rica no. 1449; San Francisco de Guadalupe, altitude 1,200 meters, *Tonduz*, flowers and fruit, November, 1893 (Instituto fís.-geog. Costa Rica no. 1551, in part); along Rio María Aguilar near San José, altitude 1,100 meters, *Tonduz*, flowers and fruit, December 29, 1892 (Instituto fís.-geog. Costa Rica no. 2768); Alto de Ochomogo, altitude 1,500 meters, *Tonduz*, flowers and fruit, October, 1896 (Instituto fís.-geog. Costa Rica no. 10904); bushes around Nicoya, altitude 300 meters, *Tonduz*, fruit, January, 1900 (Instituto fís.-geog. Costa Rica no. 13509).



FIG. 29.—Leaf of *Cyclanthera naudiniana*. Scale ⅓.

GUATEMALA: Carrizal, Department of Santa Rosa, altitude 2,700 meters, *Heyde & Lux*, flowers, November, 1892 (Donnell Smith Herbarium no. 4187).

**3. Cyclanthera naudiniana** Cogn. in DC. Monogr. Phan. **3:** 831. 1881. FIGURE 29.

General distribution: From Texas and New Mexico south to Panama.

COSTA RICA: Found by Warscewicz, about 1848 (Herb. Boissier), but not reported since.

**4. Cyclanthera langaei** Cogn. Diagn. Cucurb. **2:** 67. 1877. FIGURES 30, 34.

General distribution: Middle America, from Central Mexico to Panama.

COSTA RICA: El Titoral, near Rio Birrís, slopes of Volcan Irazú, altitude 2,400 meters, *Pittier*, flowers, January 28, 1889 (Instituto fís.-geog. Costa Rica no. 881); Carrillo, Rio Sucio Valley, altitude 3,002 meters, *Cooper*, flowers, July, 1888 (Instituto fís.-geog. Costa Rica no. 888); San Francisco de Guadalupe near San José, 1,200

meters, *Tonduz*, flowers, December, 1895 (Instituto fís.-geog. Costa Rica no. 1551, mixed with *C. tonduzii*); around Sipurio, Talamanca, altitude 100 meters, *Tonduz*, flowers, March, 1894 (Instituto fís.-geog. Costa Rica no. 8704); Jimenez, plains of Santa Clara, altitude 220 meters, *Donnell Smith*, flowers, March, 1894 (Donnell Smith Herbarium no. 4820); Suerre, plains of Santa Clara, altitude 300 meters, *Donnell Smith*, flowers, February, 1896 (Donnell Smith Herbarium no. 6523); on bushes along Rio Pedregoso at El Copey, altitude 1,800 meters, *Tonduz*, flowers and fruits, April, 1898 (Instituto fís.-geog. Costa Rica no. 12195); pastures at the foot of the Turrialba Volcano, altitude 2,400 meters, *Pittier*, flowers, January 1, 1899 (Instituto fís.-geog. Costa Rica no. 13228); on bushes around Nicoya, altitude 300 meters, *Tonduz*, fruit, January, 1900 (Instituto fís.-geog. Costa Rica no. 13509); Chirripó Farm, Zent Plains, altitude 50 meters, *Pittier*, flowers, January, 1900 (Instituto fís.-geog. Costa Rica no. 16067).



FIG. 30.—Leaf of *Cyclanthera langaei*.

**Cyclanthera langaei gracillima** Pittier, subsp. nov.

Stems, petioles, tendrils and rachis of the male inflorescences very slender and elongate. Leaves rather large; lateral leaflets usually bilobate, the middle one long and narrow.

COSTA RICA: Hedges at Ochomogo, altitude 1,500 meters, *Tonduz*, flowers, October, 1896 (Instituto fís.-geog. Costa Rica no. 10904).

**5. Cyclanthera costaricensis** Cogn. Diagn. Cucurb. 2 (1877), 73.

COSTA RICA: San José (Oersted no. 23, Copenhagen Herb.). Not found since.

**5a. Cyclanthera costaricensis angustiloba** Cogn. loc. cit.

COSTA RICA: Ujarrás, altitude about 1,000 meters (*Oersted* 24, Copenhagen Herb.). Not found since.

**6. Cyclanthera explodens** Naud. Ann. Sci. Nat. IV. **12:** 160. 1859.

General distribution: Northern Andes of South America, in Ecuador, Colombia, and Venezuela; Western Central America to El Salvador.

COSTA RICA: Bushes at La Verbena near San José, about 1,200 meters above sea-level, *Pittier & Tonduz*, flowers and fruit, December, 1894 (Instituto fís.-geog. Costa Rica no. 9088, type); San Francisco de Guadalupe near San José, altitude 1,200 meters, *Tonduz*, flowers and fruit, December, 1895 (Instituto fís.-geog. Costa Rica no. 9826).

## ELATERIOPSIS.

In 1872 Doctor Ernst discovered in Venezuela a new cucurbitaceous plant, which he placed between Elaterium and Hanburya under the name of *Elateriopsis caracasana*.[a] In this genus, the stamens are 5 (or sometimes 4), 4 of them being connate in two pairs, thus reducing the apparent number to 3; the stigmas are distinctly 3-lobate and the seeds rather large and flattened with a thin, sinuate margin. These characters are in themselves sufficient to segregate Elateriopsis as a generic unit, so that, notwithstanding his rather conservative tendencies, Mr. Cogniaux felt first inclined, in 1877,[b] to uphold it, and even increased it by one species (*E. macropoda*), transferred from Momordica. But in 1881, the same author receded from the former position and amalgamated Elateriopsis with Cyclanthera as a mere

[a] See Flora **56:** 257. 1873.

[b] Diag. Cucurb. **2:** 82. 1877.



ELATERIOPSIS OERSTEDII (COGN.) PITTIER.

section, now increased to six species.[a] If, however, it is remembered that Cyclanthera as a genus rests mainly on the peculiar structure of the andrœcium, reduced to one stamen with a disk-like anther, while in Elateriopsis the same is formed of 5 stamens with sinuous anthers made up in a regular head, it will be at once evident that the fusion of the two genera is not justified, and that Elateriopsis has more affinities with the Sicyoideae than with the Cyclantherae. This is the view taken by Müller and Pax in the Pflanzenfamilien,[b] following which we restore the Costa Rican *Cyclanthera oerstedii* Cogn. to its true place under Elateriopsis in the revision below. In general appearance, as well as in details, it differs widely from any of our Cyclantherae, the fruit being the one exception: it is similar in appearance, although quite smooth, to that of *Cyclanthera pedata* and like that is used as a green vegetable under the name of *caífa*. As the materials on which Mr. Cogniaux founded this species were incomplete, lacking female flowers and fruits, and we have been fortunate enough to obtain good specimens of the latter and also of the seeds, a new description of the plant is here given, female flowers remaining a desideratum.

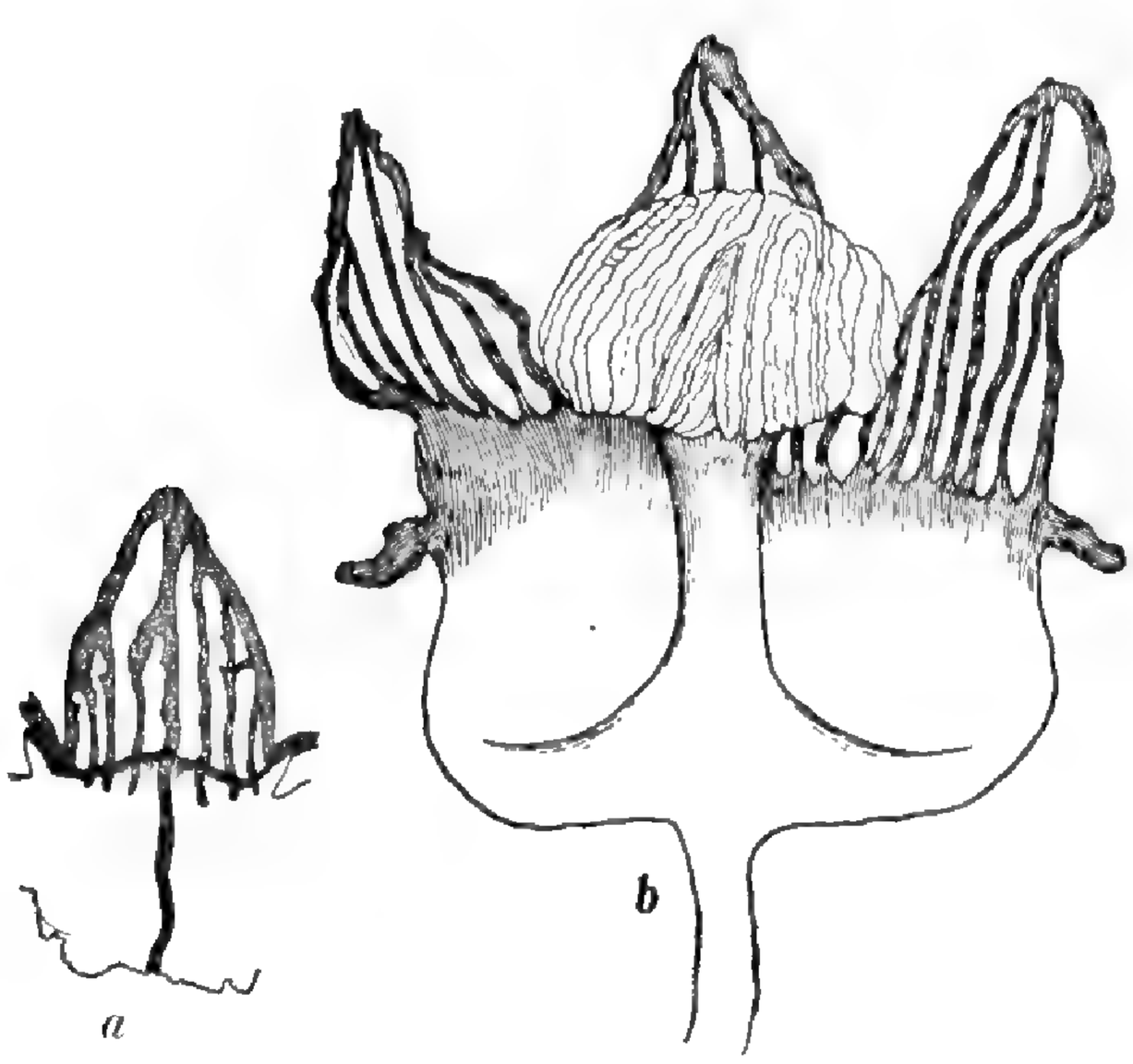



FIG. 31.—Flower parts of *Elateriopsis oerstedii* and *E. oerstedii biolleyi*. Of former, *a*, part of male flower showing calyx teeth and lobe of corolla. Of latter, *b*, longitudinal section of male flower. *a*, *b*, Scale 3.

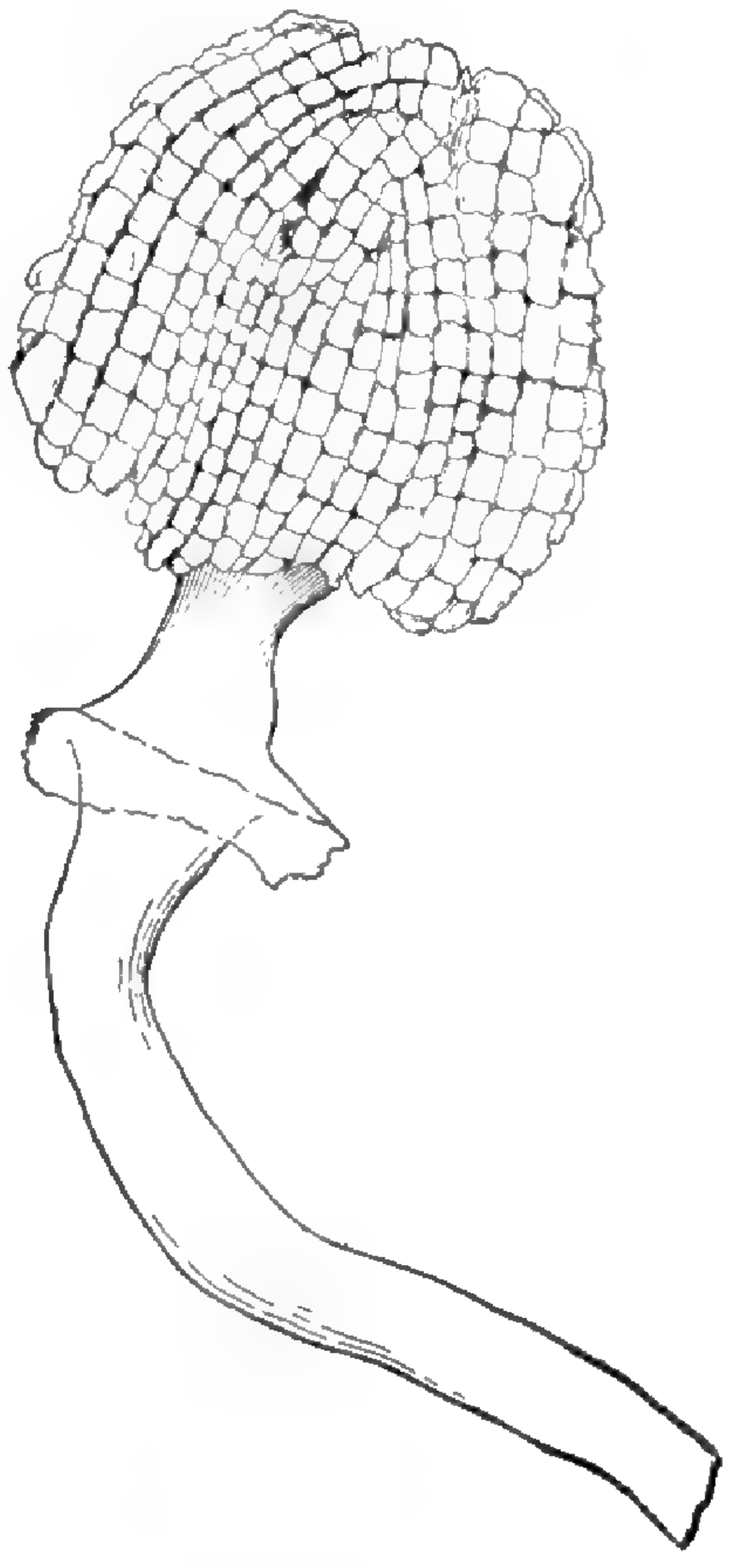


FIG. 32. Staminal head of *Elateriopsis oerstedii*. Scale 6.

**Elateriopsis oerstedii** (Cogn.) Pittier. PLATE 19. FIGURES 31–34.

*Cyclanthera oerstedii* Cogn. in DC. Monogr. Phan. **3:** 856. 1881.

Stems robust, deeply 5-sulcate, glabrous or slightly pubescent in the furrows, branching, densely foliated. Branchlets short.

Leaves rather large. Petioles 3 to 6 cm. long, slender, glabrous, striate. Leaf blades 6 to 15 cm. long, 7 to 18 cm. broad, more or less emarginate at base, angulate or

[a] DC. Monogr. Phan. **3:** 330, 824. 1881.

[b] Engl. & Prantl, Pflanzenfam. **4**[5]**:** 36. 1889.

obscurely trilobate, chartaceous, dark green, glabrous and minutely dotted above, paler and glabrous, except along the hairy, prominent ribs beneath; margin set with remote, minute teeth, the rather rounded angles and tips abruptly contracted into a short, obtuse point. Tendrils slender, 2-branched, the striate peduncle 2 to 5 cm. long.

Rachis of the male inflorescence robust, sulcate, glabrous, 5 to 20 cm. long, bearing from the middle 10 to 25 isolated flowers. Pedicels filiform, 8 to 23 cm. long, pubescent,[a] more or less erect. Calyx broadly campanulate, sparsely pubescent, 3 to 4 mm. deep, 6 to 7 mm. broad; teeth subulate, reflexed, 0.5 to 1 mm. long. Corolla greenish white, pubescent without, papillose within; lobes ovate-lanceolate, more or less rounded at tip, 5 to 6 mm. long, 4 to 5 mm. broad at base, thick on the brownish margin and more or less distinctly marked with 7 dark longitudinal bands. Filaments adnate in a single column, about 2.5 mm. long; anthers sessile, coherent, forming a depressed, rounded head, about 5 mm. in diameter. Female flowers not known.

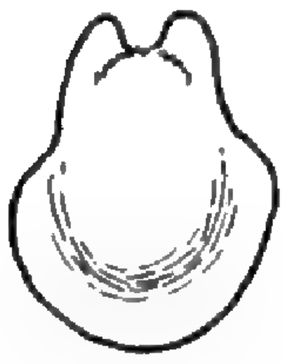


FIG. 33.—Seed of *Elateriopsis oerstedii*. Natural size.

Fruiting peduncle 2 to 3 cm. long, thick, geniculate. Fruit oblique, subconic, acute, 6 to 8 cm. long, 3 to 4 cm. in diameter, fleshy, smooth, light green and striate with darker longitudinal lines, elastically dehiscent, obscurely 3-celled, each cell with several seeds. Seeds obovate, attenuate and emarginate at the base, flattened, brownish, about 17 mm. long and 16 mm. broad.

COSTA RICA: San José, *Oersted* 20 (Copenhagen Herbarium); Cerro de Catalina, *Oersted* 18 (herb. cit.); Pacaca, near San José, *Oersted* 19 (herb. cit.); Juan Viñas, Reventazon Valley, altitude 1,000 meters, *Cook & Doyle* 221, male flowers and fruits, April 22, 1903 (U. S. National Herbarium no. 474016); Cartago, altitude 1,400 meters, *Cooper*, male flowers, March, 1888 (Donnell Smith Herbarium no. 5776).

EXPLANATION OF PLATE 19.—Stem with leaves and fruit; section of fruit. From a photograph taken by Cook & Doyle at Juan Viñas.

**Elateriopsis oerstedii biolleyi** Pittier.

FIGURE 31.

*Cyclanthera oerstedii biolleyi* Cogniaux, ined.

Stems, petioles, rachis, and pedicels glabrous; flowers larger than in type; calyx minutely pubescent, woolly-tomentose on the margin; teeth 2 to 2.5 mm. long. Lobes of the corolla longer and narrower (9 mm. long, 4 mm. broad).

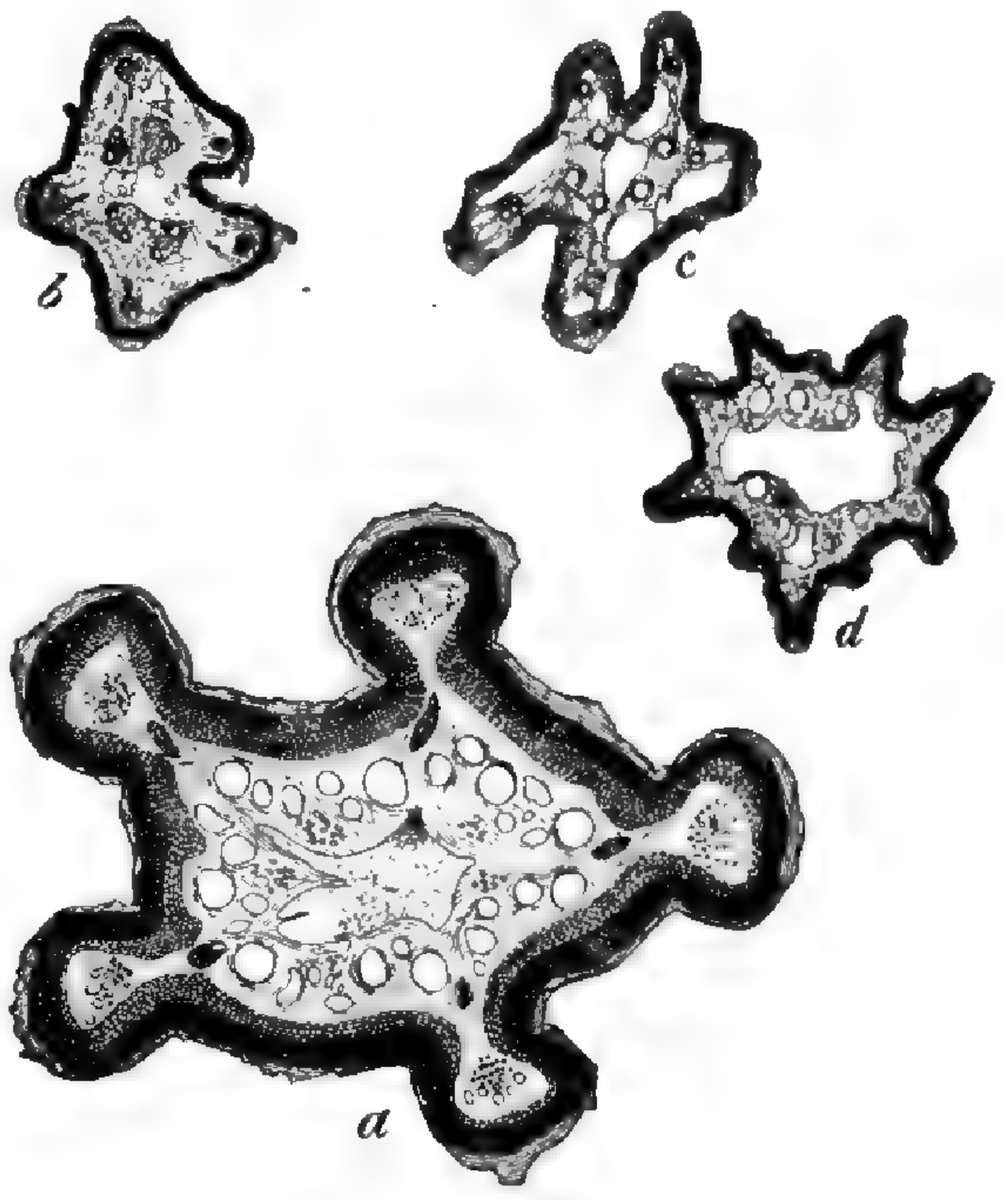



FIG. 34.—Transverse sections of stems of Elateriopsis, Cyclanthera, and Frantzia. *a*, Of *E. oerstedii; b*, of *C. tonduzii; c*, of *C. langaei; d*, of *F. pittieri. a–d*, Scale 6.

[a] Cogniaux's description reads: "Pedicelli filiformes, patuli, glabri, ad medium articulati, 8 to 15 mm. longi." We fail to see the articulation in any of our specimens; in a few cases there are traces of a diminutive bractlet, but this is far from being a general character; also the pubescence of the pedicels is conspicuous. As to the dimensions and other numerical data, they are at variance in both descriptions almost from beginning to end. It may be argued, moreover, that the able monographer of the Cucurbitaceae did not take sufficient notice of the striking structural differences in the stems of Cyclanthera and Elateriopsis, which are shown in the cross-sections here reproduced (fig. 34).

Costa Rica: At the fork of the Puerto Viejo and Sarapiquí rivers, in the northern plains, altitude about 100 meters, *Biolley*, male flowers, January, 1893 (Instituto fís.-geog. Costa Rica no. 7418).

## FRANTZIA, A NEW GENUS.

Mr. Cogniaux also published in 1892[a] the diagnosis of a new Costa Rican Cucurbitacea, which, on account of superficial appearances only, he placed near his *Cyclanthera oerstedii*. This is his *C. pittieri*. On examining the numerous specimens distributed under that name by the Instituto físico-geográfico, most of which are in the National Herbarium, it is found that they represent at least two distinct species and furthermore that they can not belong to the genus Cyclanthera, on account of the 5 anthers, nor to Elateriopsis, since the ovary contains a single pendulous ovule. The fruits are not oblique and the ovate, flattened seeds do not recall those of either of the above-named genera. Moreover, both male and female flowers exhibit a feature quite new, as it seems, among the related Tropical American Cucurbitaceae, in the shape of ten nectaries forming a depressed-rounded cushion at the base of the reproductive organs. The male and female flowers scarcely differ except in the sexual features.

These plants are closely related to Sechium on account of the similarity of the andrœcium and the fruit. But their cushion-like nectarial apparatus, the relative smallness of the seed, and other particulars that can be seen in the respective descriptions exclude them from that genus, as well as from Sicyos, although they show also marked affinities with the species of the section Atractocarpos[b] of that genus. For these reasons, we have created for them the new genus Frantzia, named after the late Dr. Alexander von Frantzius, a noted investigator of the fauna and physical geography of Costa Rica.

**Frantzia** Pittier, gen. nov.

Flowers monœcious. Male inflorescence racemose. Calyx and corolla adnate, rotaceous. Calycinal teeth 5, triangular or thick and rounded. Segments of the corolla 5, spreading, ovate-lanceolate. Nectaries 10, forming a spheroidal cushion at the bottom of the corolla, and each one opening on the periphery by a low arched hole. Stamens 5, the filaments connate in a single column; anther cells more or less free and forming an irregular head. Pollen grains globose, minutely echinate. Pistillodium none. Female flowers solitary in the same axils with the male ones. Calyx and corolla as in the latter. Openings of the nectaries larger. Staminodes none. Ovary fusiform, 1-celled; ovule single, pendulous from the apex of the cell; style short; stigma capitate, 4-lobed. Fruit fibrous or woody, ovate-rounded, more or less aculeate, 1-seeded, apparently indehiscent. Seed ovate, depressed, with smooth testa.

Two or more Costa Rican herbaceous species, climbing, glabrous or almost so; leaves deeply emarginate at the base, palminerve, entire or more or less deeply 3 to 5-lobate. Flowers small, whitish or yellowish.

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[a] Bull. Soc. Bot. Belg. **30**: 276. 1892.

[b] In *Sicyos warmingii* Cogn., a Eusicyos, we even note at the bottom of the corolla a cupuliform appendage that looks singularly like a nectarial structure of the same class as the one found in our Costa Rican plants. See Mart. Fl. Bras. **6**[4]: *pl. 33*. 1878.

Type species *F. pittieri.*

Leaves partly hairy, densely covered with conspicuous white dots, and narrowly 3-lobate.....*F. montana.*
Leaves quite glabrous, entire or broadly 3 to 5-lobate.....*F. pittieri.*

**1. Frantzia montana** Pittier, sp. nov. FIGURES 35, 36.

A climbing vine. Stems rather slender, sulcate, glabrous.

Petioles slender, striate, smooth, 3 to 4 cm. long. Leaf blades 8 to 10 cm. long, 7 to 12 cm. broad, coriaceous, dark green, glabrous, except on the main ribs, and densely covered with white dots above, paler or brownish and more or less hairy-scabrous beneath, broadly emarginate, divided almost to the base into 3 more or less parted lobes; main ribs hairy above, prominent and more or less scabrous-puberulent, as are the primary veins, on the lower face; median lobe varying from narrowly lanceolate (7.5 cm. long, 1.5 cm. broad) to obovate-acuminate (8 cm. long, 3 cm. broad); lateral lobes broader, more or less falciform and auriculate; interlobular sinuses sometimes very narrow, sometimes broadly open; margins more or less sinuate-dentate. Tendrils 3 to 4-fid, glabrous, the peduncle striate, about 2 cm. long.

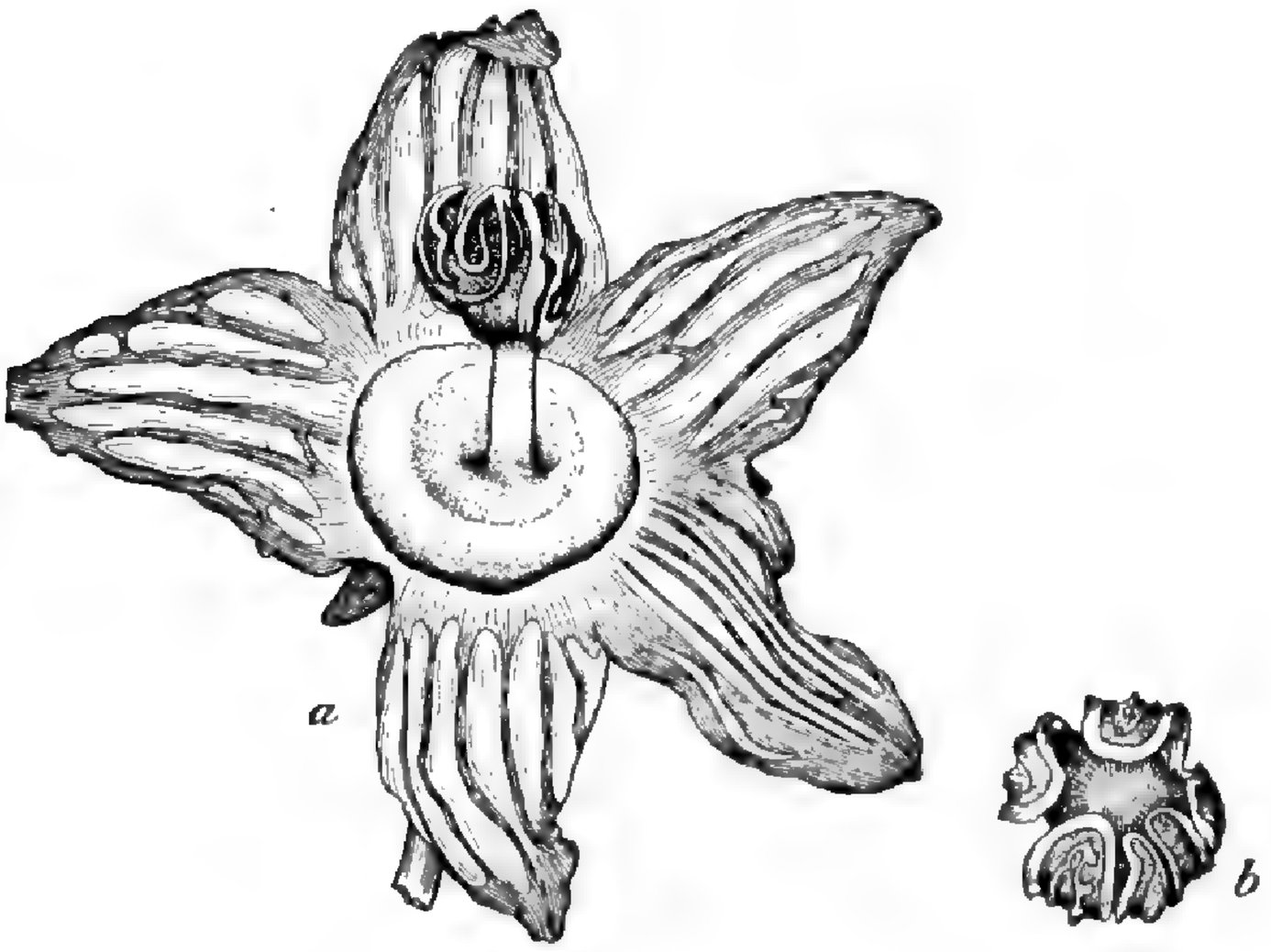



FIG. 35.—Flower and anthers of *Frantzia montana.* *a*, Male flower; *b*, anthers. *a*, *b*, Scale 6.

Rachis of the male inflorescence 15 to 28 cm. long, rather slender, striate, glabrous. Flowers in sessile or short-stipitate clusters; pedicels filiform, smooth, 3 to 5 mm. long. Calyx cupuliform, about 4 mm. in diameter, sparsely covered with short, appressed hairs; teeth rounded-subulate, 0.5 to 0.7 mm. long. Nectaries forming a spongy, transparent cushion; walls dividing the nectary cells not visible. Corolla pale yellow, sparsely covered outside with short, brownish hairs, smooth or slightly papillose inside; lobes broadly lanceolate, rounded at tip, 3.5 mm. long, 2 mm. broad, bearing 7 brown, salient, longitudinal striæ. Staminal column 1 to 1.2 mm. long; anthers more or less coherent, in a head about 1.7 mm. in diameter. Female flowers not seen. Fruit ovoid, about 4.5 cm. long and 3 cm. in diameter, echinate; spines hard, acute, arcuate. Seed compressed, smooth, 2 cm. long, 1 cm. broad.

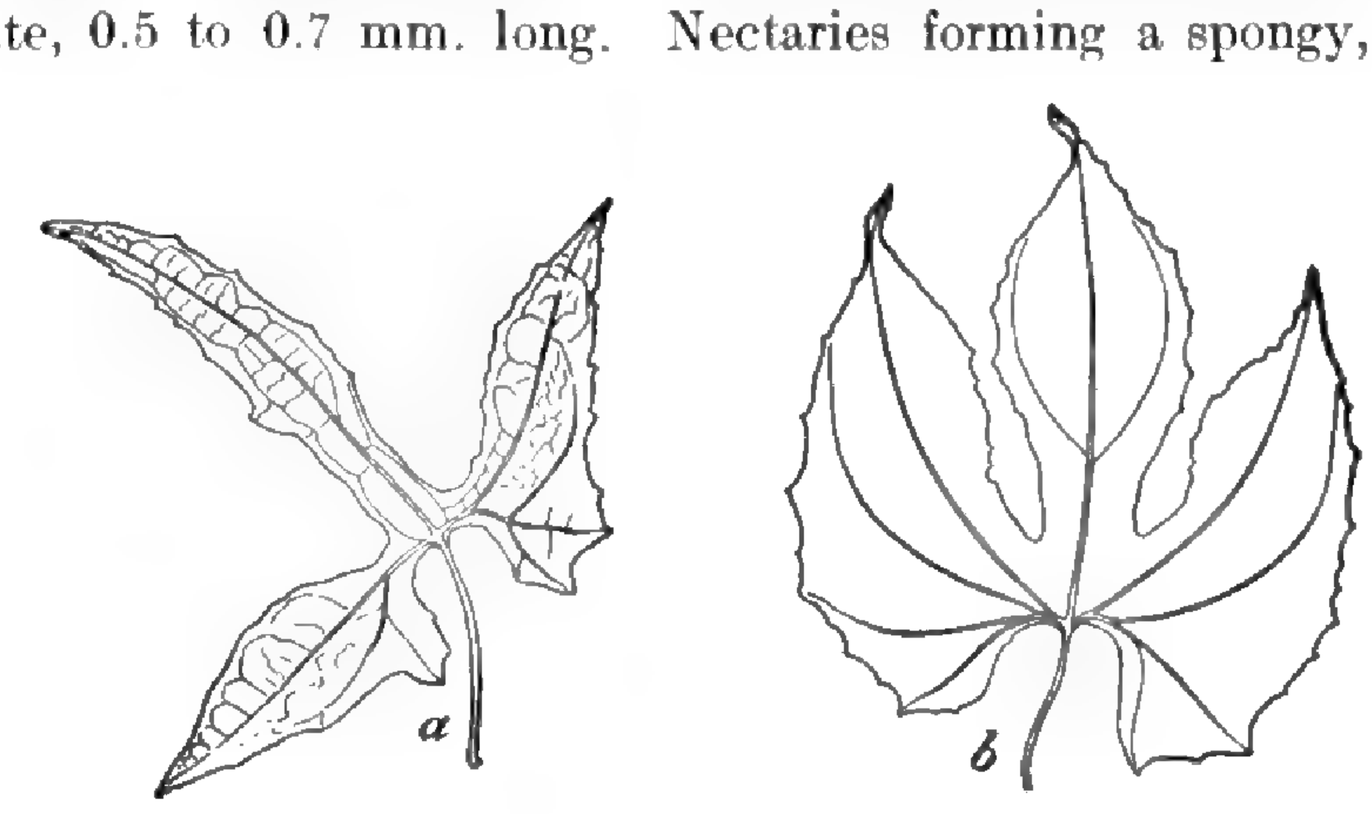



FIG. 36.—Leaves of *Frantzia montana.* *a*, *b*, Extreme forms. Scale ¼.

COSTA RICA: Climbing on old trunks in the pastures on the slopes of the Turrialba Volcano, at an altitude of 2,500 meters, *Pittier*, flowers and fruits, January 1, 1899 (Instituto fís.-geog. Costa Rica, no. 13192, type); bushes at La Laguna del Copey, 1,800 meters above sea level, *Tonduz*, flowers, April, 1898 (Instituto fís.-geog. Costa Rica no. 12223).

**2. Frantzia pittieri** (Cogn.) Pittier. FIGURES 37, —, 39.

*Cyclanthera pittieri* Cogn. Bull. Soc. Bot. Belg. **30:** 275. 1891.

Plant entirely glabrous. Stems slender, branched, densely foliose, 10-sulcate, smooth.

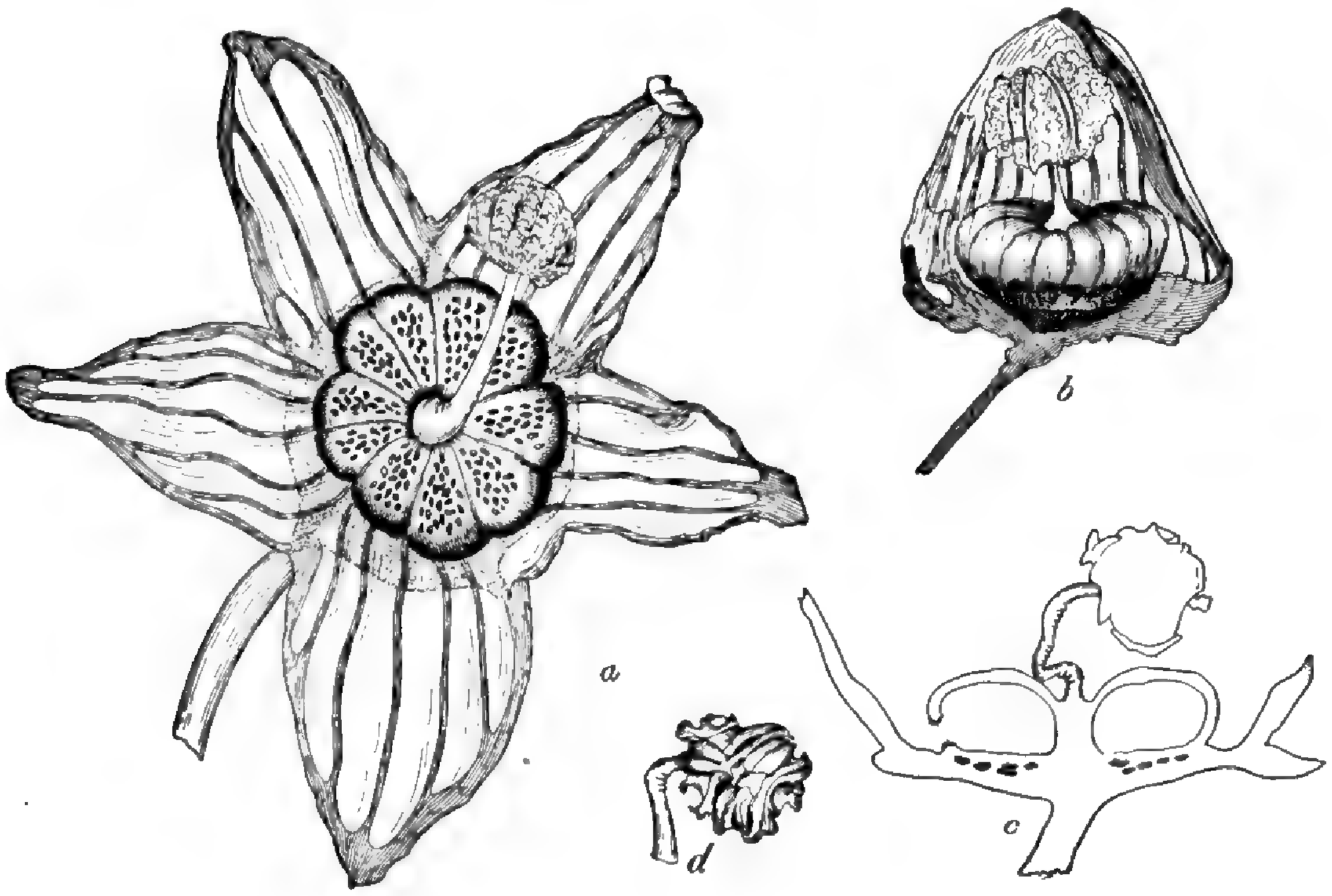



FIG. 37.—Male flower of *Frantzia pittieri* with parts. *a*, Flower; *b*, transparent bud; *c*, transverse section, showing nectaries; *d*, stamens. *a–d*, Scale 6.

Petioles striate, 3 to 5 cm. long. Leaf blades about 10 cm. long, 9 to 12 cm. broad, deep green above, paler beneath, densely and minutely white-dotted above, entire

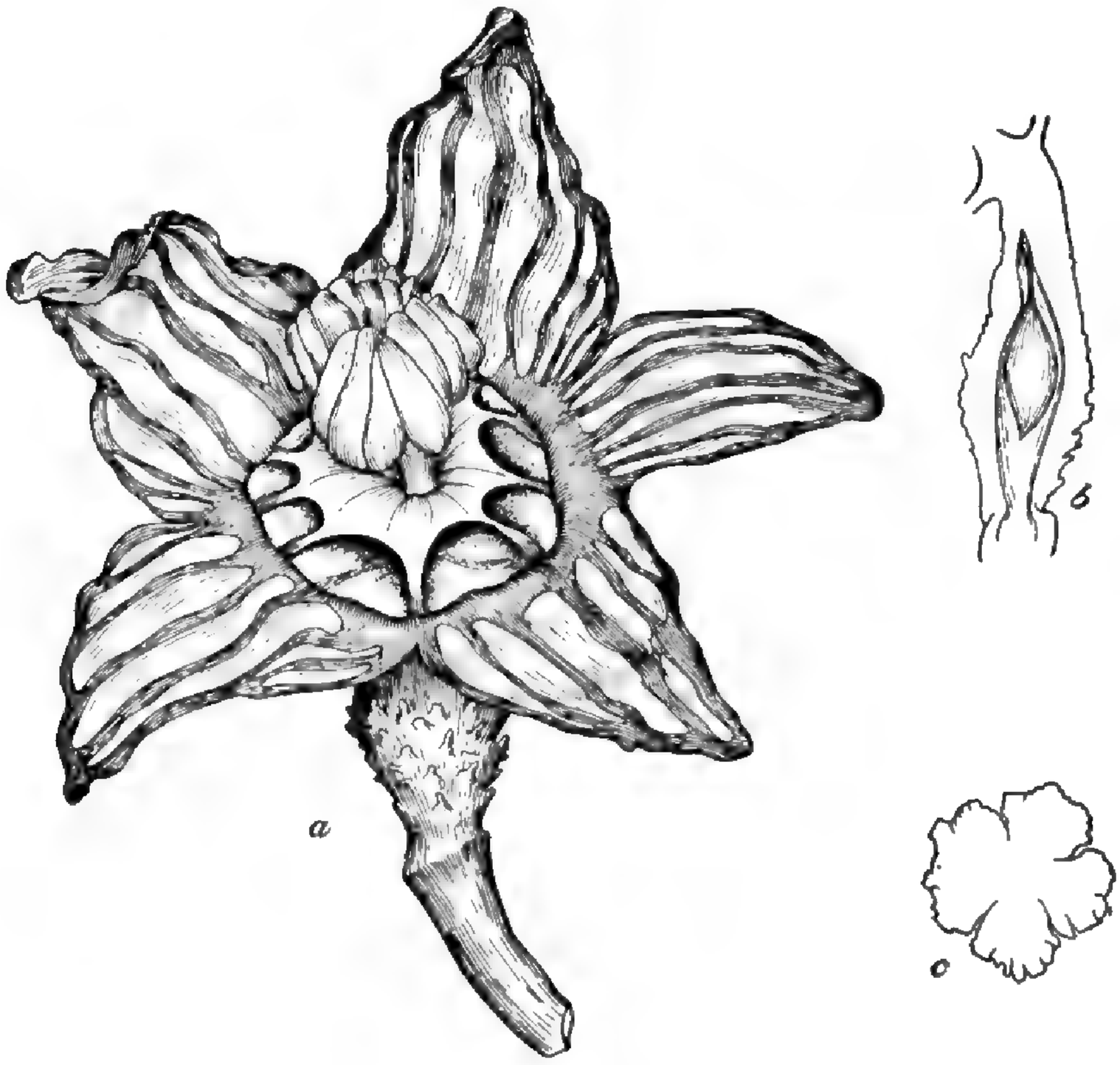



FIG. 38.—Female flower of *Frantzia pittieri* with parts. *a*, Flower; *b*, ovary, longitudinal section, showing pendulous ovule; *c*, transverse section of the 4-lobed stigma. *a–c*, Scale 6.

and more or less rhomboidal or subtrilobate, deeply emarginate at the base; margin wide-toothed, the teeth broad and obtuse. Tendrils 3 to 5-branched, the common peduncle rather slender, 2 to 4 cm. long, the branches filiform.

Rachis of the male inflorescence 10 to 25 cm. long, slender, flowered almost from the base; flowers very numerous, in 14 to 18 alternate clusters; pedicels filiform, 3 to 7 mm. long. Calyx rotaceous, about 5 mm. in diameter, the teeth 1 mm. long, thick, obtuse, emerging about 0.5 mm. in the sinuses of the corolla. Corolla 1 cm. in diameter, spreading; lobes ovate-lanceolate, 4 mm. long, 3 to 3.5 mm. broad at the base, with thickened margin and 7 longitudinal salient ribs. Nectary cushion about 3.5 mm. in diameter, 1.2 mm. high, the walls of the cells appearing from above as 10 dark rays, corresponding alternately to the midveins of the corolla lobes and to the calycinal teeth. Staminal column slender, 2.6 mm. long, thicker at the base; anthers sessile, coalescing in a rounded head, about 1.5 mm. in diameter. Pollen grains 0.087 mm. in diameter, echinate. Pedicels of the female flowers 3.5 mm. long, thick. Calyx and corolla as in the male flower, but slightly smaller. Nectaries widely open. Ovary 3 to 4 mm. long, about 1.5 mm. thick, with a rugose surface; style 0.8 mm. long; stigmatic head about 2 mm. in diameter, 4-lobate.

"Fruit obscurely 2-valvate, ovate-rounded, 4 to 6 cm. long, 3 to 4 cm. in diameter, smooth except at the base, or more or less echinate on its whole surface. Peduncle erect, striate, 3 to 5 cm. long. Seed smooth."

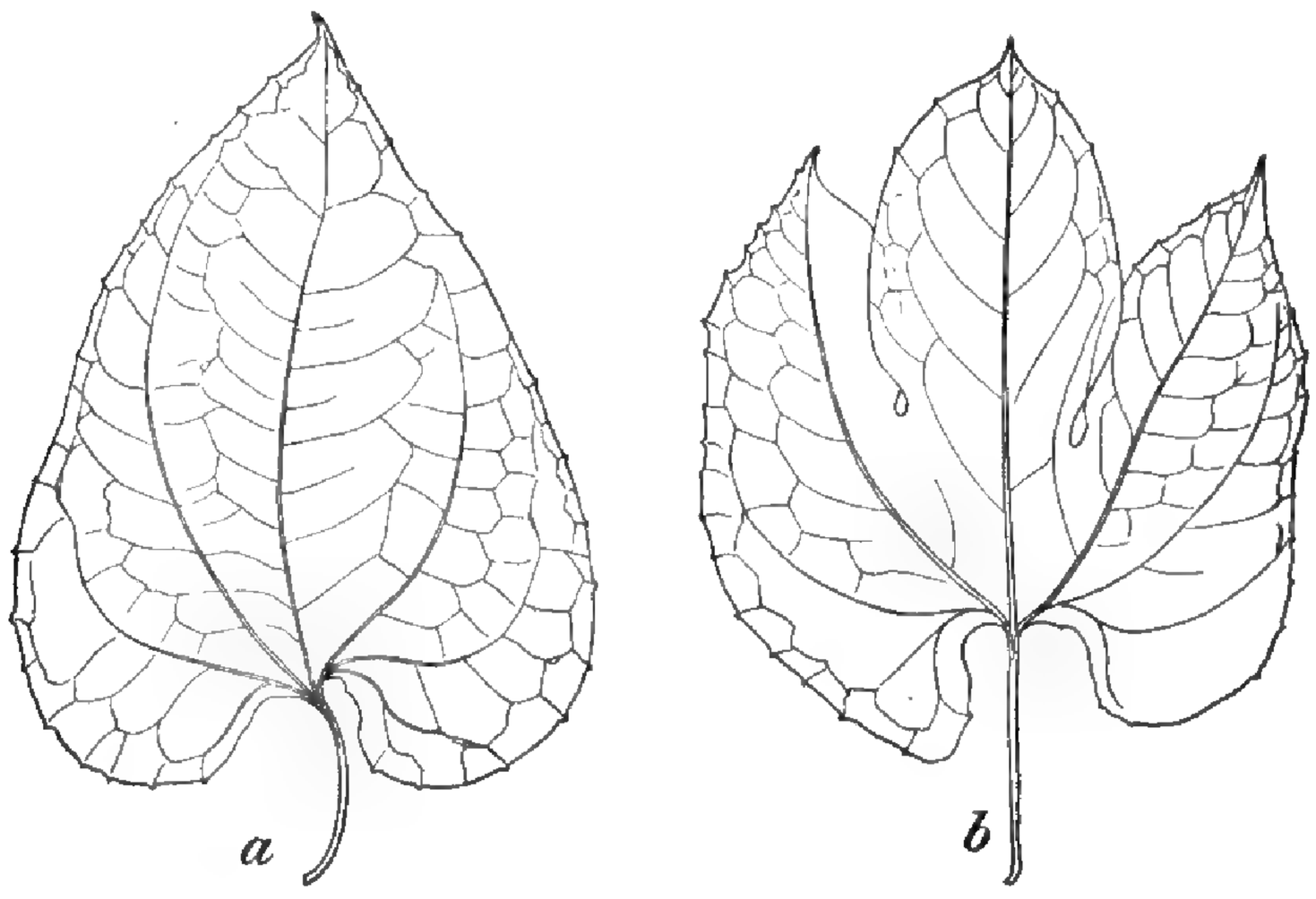



FIG. 39.—Leaves of *Frantzia pittieri*. *a*, *b*, Two types. *a*, *b*, Scale ⅓.

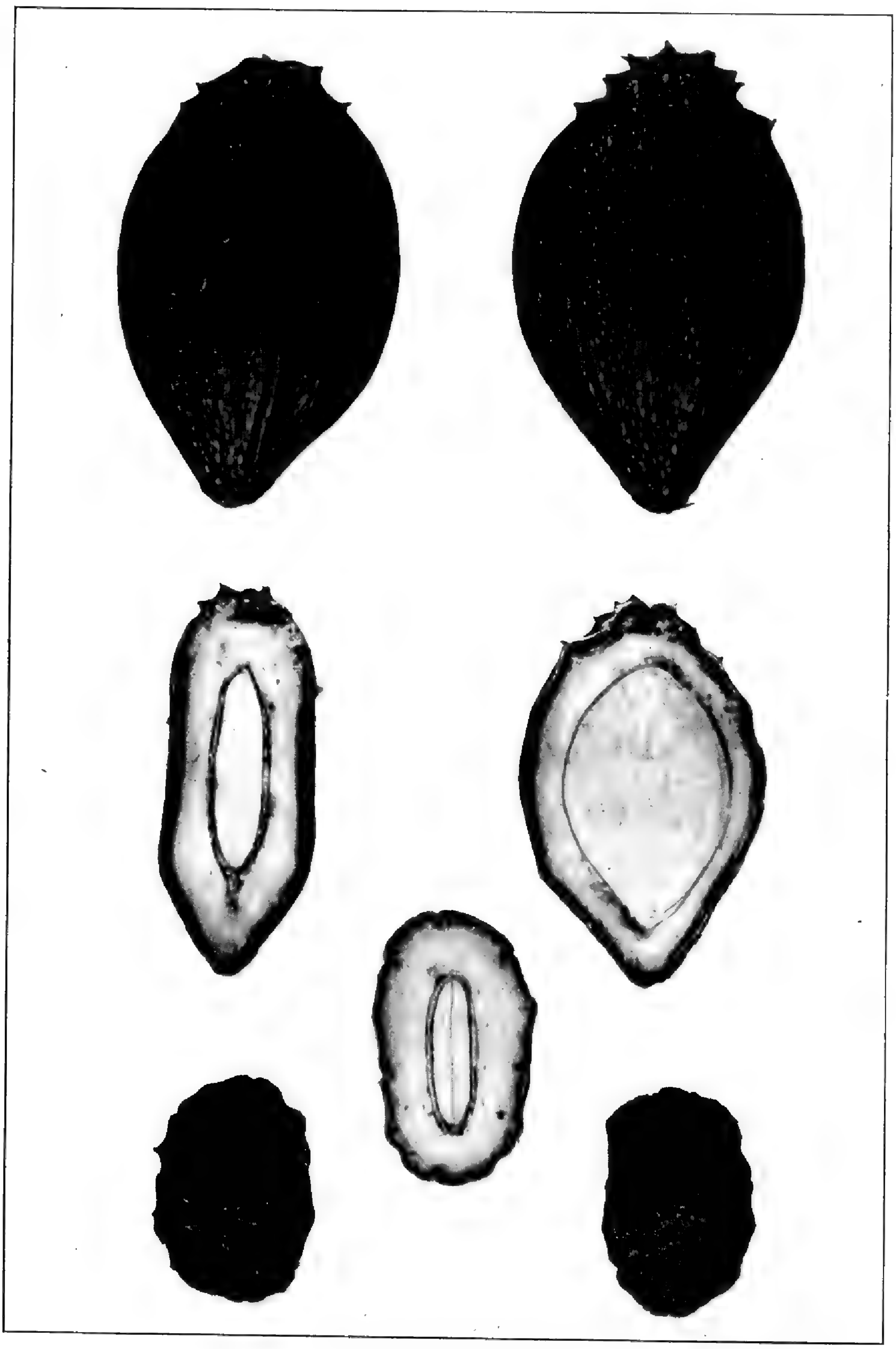
COSTA RICA: Carrillo, Rio Sucio Valley, altitude 300 meters, *Pittier*, male flowers, July 8, 1889 (Instituto fís.-geog. Costa Rica no. 1212); same locality, *Tonduz*, flowers, May 12, 1890 (Instituto fís.-geog. Costa Rica no. 2511); along path at El General, Diquís Valley, altitude 800 meters, *Pittier*, flowers, January, 1891 (Instituto fís.-geog. Costa Rica, no. 3506); forests of Xirores, Talamanca, altitude 100 meters, *Tonduz*, flowers, February, 1895 (Instituto fís.-geog. Costa Rica no. 8334); on bushes at Chirripó Farm, Zent plains, altitude below 100 meters, *Pittier*, flowers and fruits, January, 1900 (Instituto fís.-geog. Costa Rica no. 16072).

**Frantzia pittieri quinqueloba.**

*Cyclanthera pittieri quinqueloba* Cogn. Bull. Soc. Bot. Belg. **30:** 276. 1891, in part.

Leaves deeply 3 or 5-lobate; lobes ovate or oblong-lanceolate, obtuse or acuminate. Male racemes shorter and more robust, with larger flowers. Fruits larger, with longer peduncles.

COSTA RICA: Rio Toro Amarillo, plains of Santa Clara, altitude 300 meters, Donnell Smith, flowers and fruits, April, 1896 (Donnell Smith Herbarium no. 6520); bushes in Tuís Valley, altitude 650 meters, *Tonduz*, flowers, November, 1897 (Instituto fís.-geog. Costa Rica no. 11410; but this specimen may belong to a distinct species).



POLAKOWSKIA TACACO PITTIER.

## POLAKOWSKIA, A NEW GENUS.

Among the unnamed materials of the collection of the Instituto físico-geográfico we also found specimens of a plant the fruit of which is quite popular in Costa Rica as a vegetable and known under the name of *tacaco*, derived from one of the native languages.[a] At first sight this plant, which can be considered as semicultivated, since it is tolerated wherever found near or in cultivated fields, seems to come very close to the well known *Sechium edule*. But on examining the male flowers, it is found that they are provided with 10 pouch-like nectaries, sunk into the bottom of the corolla and protruding on the outer side at the base of the calyx. This feature is also characteristic of the Mexican genus Sechiopsis Naud.; but while in our plant both male and female flowers are pentamerous and the latter solitary in the axils of the leaves, the female flowers in Sechiopsis are trimerous and form small umbels by the side of the male racemes. The fruits of the present species, moreover, are ovate, flattened, and covered with soft spines, and not triangular and winged. Here, then, we have again obvious reasons for creating a new genus, which we will dedicate to Dr. H. Polakowsky, one of the earlier students of the flora of Costa Rica and a well-known writer on subjects related to Central and South America.

**Polakowskia** Pittier, gen. nov.

Flowers monœcious. Male inflorescence racemose. Calyx and corolla connate, broadly campanulate. Calycinal teeth, small, subulate. Segments of the corolla 5, spreading, ovate-triangular. Nectaries forming 10 pouch-like pits at the bottom of the flower. Stamens 5, the filaments coherent in a slender, elongate column; anthers free, more or less spreading, one of them single, 4 connate in two pairs; anther cells diversely conduplicate and forming a depressed head. Pollen grains globose, minutely muricate, obscurely 8-sulcate. Pistillodium none. Female flowers solitary in the same axils with the male ones and smaller than these. Calyx and corolla coherent, thick, rotaceous, the former 5-toothed, the latter with 5 ovate-triangular lobes. Ovary fusiform, 1-celled, slightly setose at the base; style very short; stigma capitate, obscurely 5-lobed; ovule single, pendulous from the apex of the cell. Fruit rather fleshy, fusiform, depressed, 5-sulcate, monosperm, with soft spines at the base; dehiscence 2-valvate. Seed elliptic, compressed, the testa subligneous, smooth and with subacute margins.

A Costa Rican plant, herbaceous or suffruticose, climbing, glabrous. Roots fleshy. Stems perennial. Leaves membranous, deeply emarginate, palmate-nerved, slightly 3-lobate. Tendrils 5-fid. Flowers small, of a sallow white color. Fruit medium-sized, edible.

**Polakowskia tacaco** Pittier, sp. nov. PLATE 20. FIGURES 40, 41.

Stems slender, branched, densely foliose, sulcate, smooth, 2 to 6 meters long.

Petioles slender, striate, smooth, 3 to 8 cm. long. Leaves 5 to 9 cm. long, 5 to 11 cm. broad, deep green, densely covered with minute white dots above, paler beneath, quite glabrous; margin obscurely sinuate-dentate; lobes not deeply cut, acuminate, the middle one longer and broader. Tendrils rather thick, usually 5-branched.

---

[a] Probably from the *güetarú*, although the name is used by the Bribrí of Talamanca for the fruits of *Frantzia pittieri* (Tonduz in sched.). This fact seems to point to a very ancient use as a food plant.

Main peduncles of the male racemes robust, striate, often branched, 6 to 20 cm. long; pedicels filiform, 1 to 2.5 cm. long; flowers not less than 50 in each raceme and divided into several whorls. Tube of the calyx very short (1.5 mm.), teeth subulate, 1 mm. long. Segments of the corolla spreading, longitudinally veined, 4 mm. long, 3 mm. broad. Nectaries pouch-like, with broad openings. Staminal column almost 2 mm. long; anthers spreading, nearly sessile, 4 forming pairs and the fifth free. Pollen grain 0.080 to 0.083 mm. in diameter. Pedicels of the female flowers 3 mm. long. Calyx scarcely 2 mm. long, the subulate teeth 1 mm. long. Segments of the corolla thick, papillose inside, broadly ovate-triangular, 1.2 mm. long, 1.5 mm. broad. Nectaries none. Ovary 4 mm. long, about 1.5 mm. thick, slightly setose at the base; stigma capitate, 2 mm. in diameter.

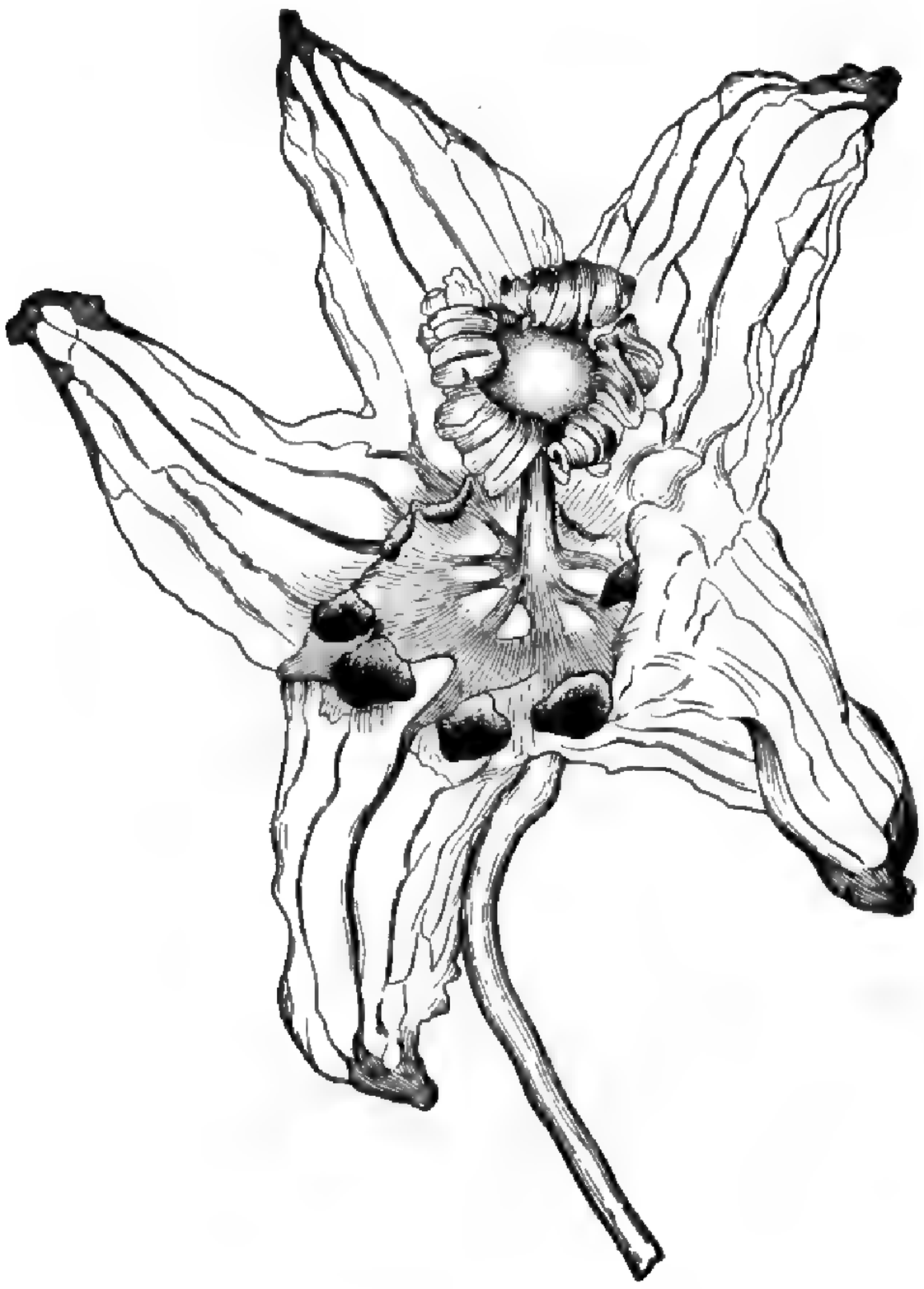


FIG. 40.—Male flower of *Polakowskia tacaco*. Scale 6.

Fruiting peduncles 3 to 4 cm. long. Fruits green, 4 to 6 cm. long, 1.5 to 2.5 cm. thick, sparsely aculeate at the base, attenuate at both ends and 5-sulcate. Seed elliptic, 27 mm. long, 15 mm. broad, about 4 mm. thick, the testa hard with subacute margins.

COSTA RICA: Around San José, wild or semicultivated on account of its fruits, used for culinary purposes, altitude about 1,200 meters, *C. Wercklé*, flowers and fruits, October, 1902 (Instituto fís.-geog. Costa Rica no. 16674; U. S. National Herbarium no. 592346, 592347 type, both sheets from the same individual).

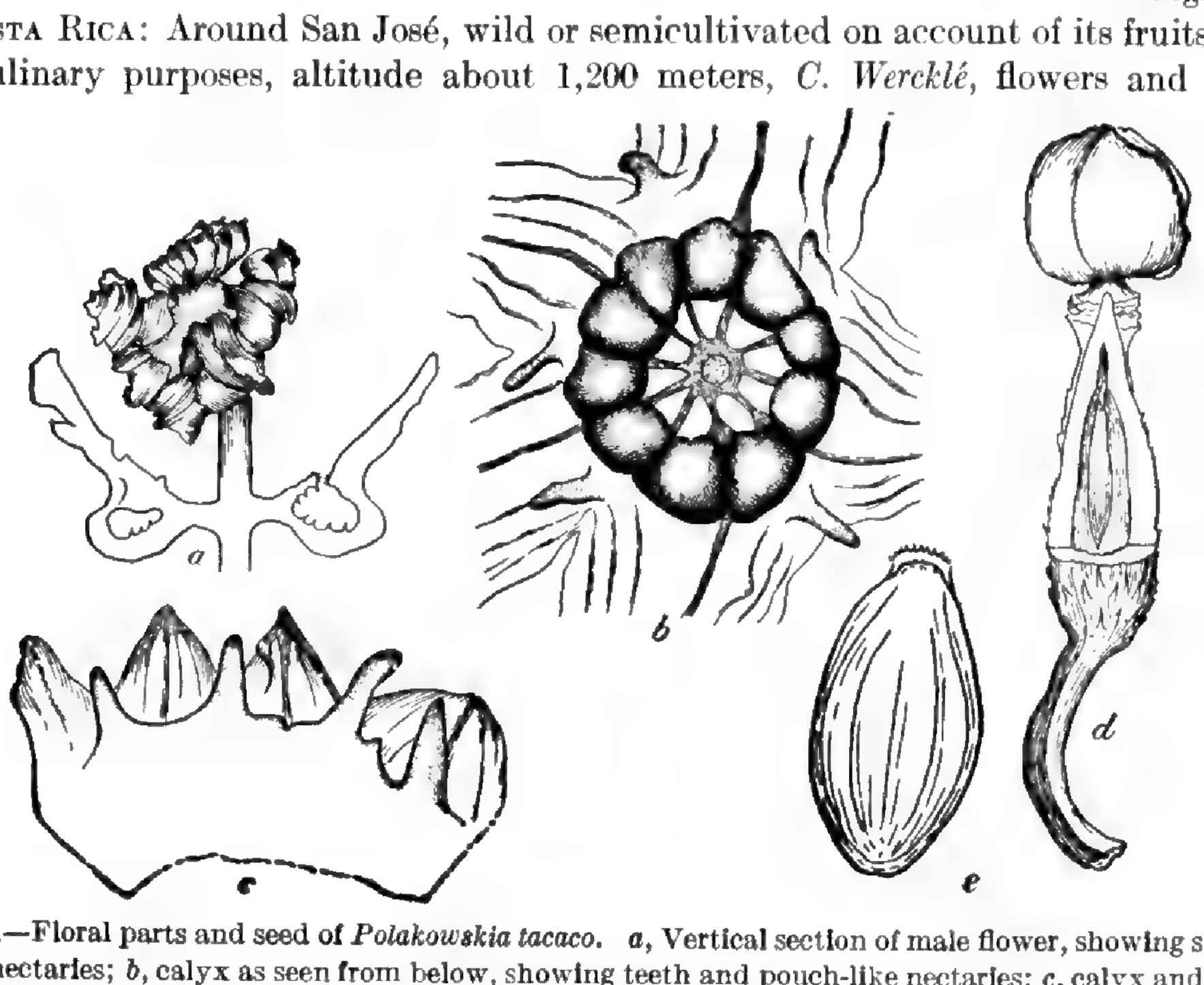



FIG. 41.—Floral parts and seed of *Polakowskia tacaco*. *a*, Vertical section of male flower, showing stamens and nectaries; *b*, calyx as seen from below, showing teeth and pouch-like nectaries; *c*, calyx and corolla of young female flower, cut open and spread; *d*, pistil partially cut open to show pendulous ovule; *e*, seed. *a–d*, Scale 6; *e*, natural size.

EXPLANATION OF PLATE 20.—Fruit, external views and sections. From material received from Costa Rica.

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SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

# CONTRIBUTIONS

FROM THE

# UNITED STATES NATIONAL HERBARIUM

VOLUME 13, PART 5

# RELATIONSHIPS OF THE IVORY PALMS

By O. F. COOK

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# PREFACE.

The relationship of the ivory palms has long been the subject of doubt and indecision among botanists. In his various expeditions to tropical America in the interest of agriculture Mr. Cook has been able to make extensive observations on the various groups of palms, including Manicaria, apparently the nearest relative of the ivory palms. This has given him important first-hand information bearing on the question of family relationships.

FREDERICK V. COVILLE,
*Curator of the United States National Herbarium.*

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# RELATIONSHIPS OF THE IVORY PALMS.

By O. F. Cook.

## HISTORICAL OPINIONS.

The plants that yield the South American vegetable ivory belong to the genus Phytelephas. Though popularly reckoned as palms their claims to this distinction have been rejected by eminent botanical authorities. It may be that this is one of the cases where general appearances gave a more correct indication than technical distinctions formulated by specialists. Some of the characters of Phytelephas have been wrongly stated, and thus made to appear more different from those of other palms than they really are, and some of the analogous specializations of other palms have been overlooked.

Martius, the most celebrated student of the palms, deferred to the popular impression to the extent of including Phytelephas in his monograph, but held that it should be classified as an independent family intermediate between the palms, the screw pines, and the aroids. Later writers, such as Hooker, Seemann, Spruce, and Drude, have followed Martius in the general policy of denying that Phytelephas is a true palm, though differing in their views of its relations with other families.

Kunth, in describing the South American plants collected by Humboldt, placed Phytelephas in a second section of the Typhinae, between the aroids and the grasses, remote from the true palms. The only character given by Kunth that would distinguish Phytelephas from other palms is the statement that it has a single spathe, "*spatha monophylla*," evidently an error in fact, for other observers have reported two or three spathes. Karsten afterwards described in greater detail the Phytelephas of the same region where Humboldt's plant was found, the upper valley of the Magdalena River of Columbia.

Seemann also believed that the affinities of Phytelephas lay with the Old World screw pines (Pandanaceae). He looked upon the Cyclanthaceae as the other American representatives of the Pandanus series, and allowed them to stand between the true palms and the "Phytelephantheae." The following statement indicates the reasons for this arrangement:

"In habit, the *Phytelephas macrocarpa* resembles the corozo colorado (*Elais melanococca* Gaertn.); so much so, indeed, that at first

sight the two are easily mistaken for each other. Both have trunks which, after creeping along the ground a few yards, ascend and attain about an equal height. Their leaves also resemble each other; and their fruit grows in a similar way, attached to comparatively short peduncles. The habit, however, is nearly the only link which connects Phytelephas with the order of Palms: its simple spadix, its imperfect flower, its indefinite number of stamens, and its embyro situated in the axis of a fleshy albumen, separate it from Palms, and proclaim it (in conjunction with other characters which it presents) a member of Endlicher's class Spadiciflorae, and Lindley's alliance Arales." [a]

The first of Seemann's diagnostic differences, the simple spadix, is certainly not peculiar to Phytelephas. Simple spadices are found in several other groups of American palms, belonging to such unrelated genera as Bactris, Geonoma, Wettinia, Chamaedorea, and Malortiea.

Imperfect flowers are the rule among palms rather than the exception. Only the primitive fan palms have perfect flowers. The completely diœcious condition found in Phytelephas is paralleled in the date palms of the Old World and in the large group of American palms belonging to Chamaedorea and related genera.

The third peculiarity alleged for Phytelephas is the indefinite number of the stamens, which here become much more numerous than in any other palm. Spruce's *Phytelephas equatorialis* is described as having more than 1,000 stamens. Most other palms have only 3, 6, or 9 stamens, but a few genera show larger multiples of 3, as Caryota, Arenga, Iriartea, Jubaea, Attalea, and Manicaria.

The considerable range of variation shown among the species of Phytelephas forbids the assignment of any very great weight to this numerical feature. Seemann described the Phytelephas of Panama as having only 36 stamens, a smaller number than is found in some of the undoubted palms. The Peruvian *Phytelephas macrocarpa* is credited by Spruce with from 150 to 280 stamens, four to eight times as many as the Panama species. Another multiplication by four would carry us from 288 to 1,152, which would approximate the number found in the species from Ecuador. Though the numbers are large they may prove not to be altogether indefinite.

Seemann's statements regarding the seed of Phytelephas certainly give no clue to a differential character. Many other palms have the embryo in a similar basal position, and thus in the axis of the albumen. Why the ivory-hard albumen should be described as

[a] Seemann, B., Botany of the voyage of H. M. S. *Herald* . . . during the years 1845–1851, p. 210. (1852–1857.)

"fleshy" is equally difficult to understand. In any event, no very serious distinction between orders or families could be based on a mere difference of consistency. The albumen is very hard in some palms and relatively soft in others.

Another South American palm, Wettinia, was at first thrown out of the group by Endlicher, because it also has a simple female inflorescence, suggestive of the screw pines and the cycads. The mistake regarding Wettinia was corrected by Spruce, who recognized the genus as a relative of Iriartea and other closely allied South American palms. It was in dealing with Wettinia that Spruce gave his reason for treating Phytelephas as a distinct natural order.

"In fact, the American plants, formerly referred to as screw pines, seem to me to constitute two distinct orders, each of equal value with Palmaceae and Pandanaceae, viz, first, Phytelephantaceae, which are (so to speak) palms with an inferior ovary; and second, Cyclanthaceae, whose inferior ovary alone separates them from Arads. Wettinia, however, is far removed from both these; the fruits are superior, and though so densely crowded on the spadix as to suggest the inferior concrete fruits of Phytelephas, there is no real resemblance to the latter."[a]

Here again a definite difference is alleged where none in reality exists. Spruce must have looked upon the conical protuberances that cover the clusters of Phytelephas nuts as representing the floral envelopes of "concrete fruits." The protuberances are formed in reality by the splitting of an outer layer of the fruit, quite as in other South American palms that belong to the genus Manicaria. The detailed figures of Phytelephas published by Seemann and Karsten show that the ovary is no more inferior than in other palms. It is inclosed by a ring of staminodia, as well as by the large subulate petals. Each of the several large "capitula" or "heads" that form the fruit cluster of Phytelephas represents the ripened pistil of a single flower, just as in Manicaria.

Drude, in Engler's Pflanzenfamilien, associates Phytelephas with the Malayan genus Nipa to form a subfamily "Phytelephantinae (palmae anomalae)." No characters that would call for a separation from the palms are included in the description of the family or in that of the genus Phytelephas. The omission of the erroneous statements of the older authors only makes it the more difficult to understand why the custom of associating Phytelephas with an Asiatic plant instead of with its American relatives should continue to be followed.

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[a] Spruce, R., On Five New Plants from Eastern Peru. Journal of the Linnean Society, vol. 3, p. 191. (1859.)

## COMPARISON OF ESSENTIAL CHARACTERS.

The curious external resemblance of a ripened pistil of Phytelephas to the fruit clusters of Nipa and Pandanus, which may have been the original cause of the whole confusion, is only curious and external. Each of the cones or pyramids that make up the fruit cluster in Nipa and Pandanus represents a separate fruit, from a distinct flower, whereas the cones and pyramids of Phytelephas are merely so many coarse warts on the skin of a fruit that represents the large compound pistil of one flower. There is a real correspondence or approximation between Nipa and Pandanus, but it is not shared at all by Phytelephas, except as appearances are taken in the most superficial way.

Whether Nipa is to be reckoned as a true palm or not, it certainly represents a family very distinct from the Pandanaceae, in spite of the similarity of the fruit clusters. The many Nipa fruits that have been recovered from Eocene deposits in England and other parts of Europe show that the type is an old one, not a recent derivative from some other group of palms. The family differences that separate the Nipaceae from other Asiatic palms, such as the Borassaceae, do not indicate an alliance with Phytelephas or other American palms. Even the numerical peculiarities of Phytelephas are not shared by Nipa, which has only three stamens and three carpels, and only a single seed developed from each flower.

The pistil of Phytelephas is remarkable for the number of carpels, which ranges from four to nine. Most of the palms have only three carpels, and usually only one is matured, with a single seed. In the coconut and its relatives all the carpels share in the formation of the husk and the bony shell of the fruit, but two of the ovules are usually aborted. The mature coconut has only one endosperm and one embryo. Nevertheless, in the genus Attalea, a rather close relative of the coconut, the development of two or three ovules is a frequent occurrence, and some of the South American species of Attalea produce additional carpels, so that the ripe nut contains four, five, or six kernels, each in a separate chamber of the thick shell.

In the number of carpels, as in the number of stamens, Phytelephas is unique only in the sense of furnishing an extreme of a series. Species that have only 4 to 6 carpels do not transgress the range of diversity shown in other palms. The addition of a few more carpels makes Phytelephas appear the more different from other palms, but does not compel us to relegate it to the Pandanaceae or to erect it into an independent group in order to show a very wide divergence from other types of palms.

Though Phytelephas is undoubtedly different from other palms, some of the other palms appear to have more affinity with Phytele-

phas than they have with each other. Cocoid palms like Attalea, and the curious bag palms, Manicaria, are certainly nearer to Phytelephas than they are to the fan palms. Instead of having the shells united into one, as in the cocoid palms, each seed of Phytelephas and Manicaria has its separate bony shell. The fruit of the Cocaceae is really more peculiar than that of Phytelephas, since it departs further from the structure found in other palms. Instead of rejecting Phytelephas from among the palms because its fruits differ from the Cocaceae it should be considered that in this respect Phytelephas serves to connect the Cocaceae with the other palms. Moreover, Attalea and Manicaria are both natives of the same geographical region as Phytelephas.

Except for the limitation to three carpels, the fruit of Manicaria seems to be entirely analogous to that of Phytelephas. In both cases there is an outer warty coat of fibrous material and an inner shell of bony tissue of a columnar structure. The association of Manicaria with Geonoma has no apparent reason, for the inflorescence of Manicaria has more analogy with the cocoid palms than with Geonoma.

The statement of Martius that the flowers of Manicaria are buried in pits in the spadix has been repeated by Drude, but appears to have as little warrant as some of the statements regarding Phytelephas. Bentham and Hooker were more nearly correct than Drude in that their group of "*Areae dubiae affinitatis*" included Manicaria and Leopoldinia as well as Phytelephas and Nipa. The fact that Leopoldinia has now found an apparently natural association with Geonoma, can not be considered as a reason for treating Manicaria in the same way, in the absence of common characters.

Manicaria is a less specialized type than Phytelephas, but the specializations have taken much the same direction, both in the external and internal characters. The number of stamens, 27, falls only slightly below that of some of the species of Phytelephas. Manicaria may be considered, therefore, as a link connecting Phytelephas with other palms, and especially with the cocoid series.

One of the features of Phytelephas not taken into account hitherto as an evidence of relationship is the method of germination. Seemann figured the germination of the Phytelephas that he described in Panama, but seems not to have observed the germination of Attalea. Spruce does not appear to have considered the germination of either genus.

The germination of Phytelephas is practically the same as in the cocoid genus Attalea. The embryo does not develop directly from the seed, but is carried out on a long cylindrical cotyledon. The behavior of the cotyledon of the Phytelephas has not been described, but in Attalea it burrows in the ground, carrying the embryo with it. The effect is to plant the embryo from 3 to 6 inches below the surface

of the soil, where its roots can more readily establish contacts with sources of permanent moisture.

It appears therefore that the reasons assigned for excluding Phytelephas from among the palms either are mistakes regarding the facts, or relate to characters which are almost completely paralleled among other palms. Until some new or more serious differences are discovered Phytelephas should be reckoned as a true palm. The close resemblance that Seemann pointed out between Phytelephas and *Elaeis melanococca* may not be altogether superficial. The inflorescences of Elaeis and the related South American genus Bar-



FIG. 42.—Phytelephas seedling from Panama. One-half natural size. After Seeman.



FIG. 43.—Phytelephas seedling from Colombia. One-half natural size. After Karsten.

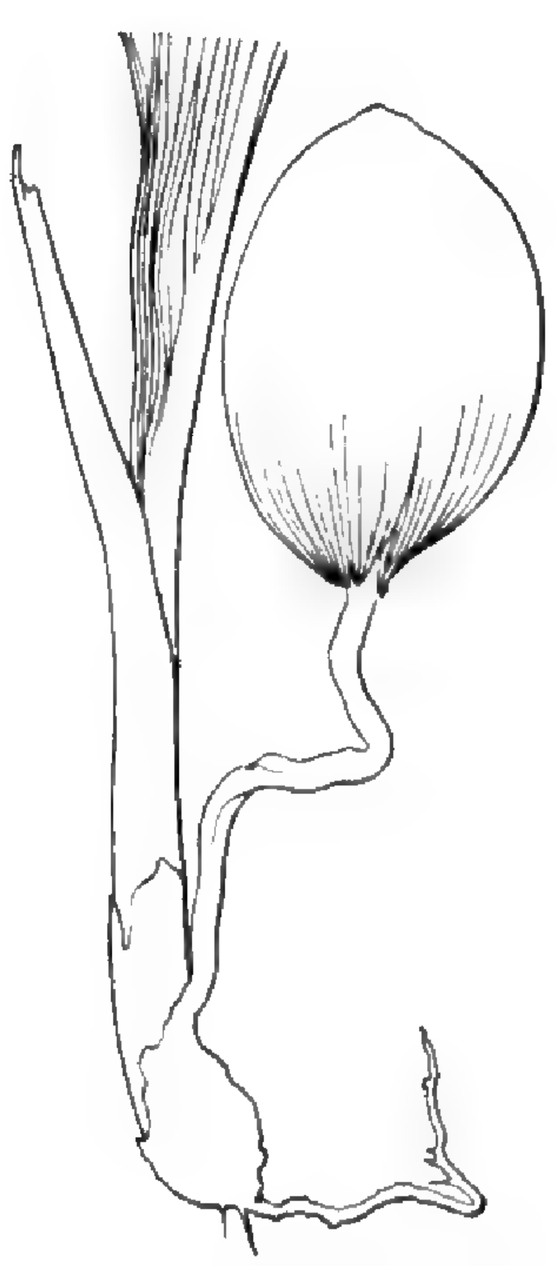


FIG. 44.—Acrocomia seedling from Guatemala. One-half natural size. From original photograph.

cella show other analogies with Phytelephas. In Elaeis the inflorescences are of separate sexes (monœcious). In Barcella the male flowers are crowded on long cylindrical catkins that run out beyond the spathes, though not nearly so far as in Phytelephas. The fact that it is possible to recognize the relationships of Phytelephas, not merely with the palms in general, but with particular groups, should have called forth a more serious questioning of the alleged reasons for rejecting it from among the palms. Though similarities should not be allowed to conceal or to cancel differences, a consistent series of similarities affords the very best evidence of relationship.

The first two or three leaves shown by the young seedling of Phytelephas after it breaks through the cotyledon are merely bladeless sheaths, also as in Attalea. Seemann shows three of these leaf rudiments in his Panama species (fig. 42), while Karsten indicates only two on the Phytelephas of the Magdalena valley (fig. 43). Seedlings of *Attalea cohune* from eastern Guatemala also have two of the bladeless sheaths, in addition to the strong, cord-like cotyledon (fig. 44).

The chief difference in the germination of the two genera is that the first foliage leaf of Phytelephas is compound or completely divided into segments like the leaf of the adult plant, whereas the first foliage leaf of Attalea has the segments completely united as in other cocoid palms. Such differences between the forms of the first leaves are paralleled in rather closely related genera of true palms, or even among the species of the same genus, as in Chamaedorea.

## DESCRIPTION OF THE PHYTELEPHANTACEAE AND ALLIED FAMILIES.

If the palms be reckoned as a natural order, divisible into families, Spruce's designation of the Phytelephantaceae as an independent group may still be maintained, but the family needs to be studied and described in its relation to other palms instead of being based on the idea of an inferior ovary or other erroneous statements.

The most important features that distinguish the Phytelephantaceae from the Cocaceae are the dioecious habit, the more numerous stamens and pistils and the inclosure of each kernel in a separate shell, instead of in a chamber of a composite bony endocarp. The Phytelephantaceae are distinguished from the Manicariaceae by the dioecious habit, the simple inflorescences, the incomplete, dehiscent spathes, and the larger number of carpels. The fruit characters that separate the Phytelephantaceae from the Cocaceae serve the same purpose for the Manicariaceae. The following descriptions summarize the peculiarities of the three groups:

### Family COCACEAE.[a]

Inflorescences simple or with simple branches.

Spathes two, leathery or woody, the outer usually short, the inner complete, sometimes deciduous at the time of flowering.

---

[a] Martius used "Cocoinae" for the family name, and on this analogy "Cocoaceae" might be used instead of "Cocaceae," on the ground that "Cocos" was derived from "coco," an indeclinable barbaric word. It is possible, however, to consider that the word became latinized, or at least hellenized, when Linnæus wrote it with the final consonant, and thus became declinable in the usual manner of words ending in "os" or "us." If it were maintained that "Cocos" is strictly indeclinable the family name would need to be written "Cocosaceae."

Flowers in groups of three, two staminate above one pistillate, or the male flowers in pairs and the female separate at the base of the spadix, or its branches; rarely the sexes in separate inflorescences, but still on the same plant.

Flowers with distinct three-parted calyx and corolla; stamens 6 to 24; pistils of three coalesced carpels, rarely with 4 to 6 carpels; stigmas usually short and not coalesced.

Fruits with apical stigma scars; outer skin firm or membranous, covering a fleshy or fibrous pulp or husk and a bony endocarp representing the three coalesced carpels, and each carpel perforated by an operculate foramen for the emergence of the seedling at germination.

Seeds usually single, sometimes two or three, or even four to six, round, or oblong, or segmental; albumen not ruminate, solid, or with a central cavity, sometimes including liquid. Embryo basal, peripheral, or apical, located opposite the largest of the foramina.

Germination direct or by the extension of a long burrowing cotyledon; first leaf-blades entire.

## Family MANICARIACEAE.

Inflorescences with numerous subequal simple branches, rising from a short axis.

Spathes two, the outer usually short, the inner complete, indehiscent, spread out into a fibrous network by the growth of the flowers and fruits.

Flowers of both sexes on the same inflorescence, the staminate crowded above, the pistillate separate below.

Male flowers with delicately membranous semicircular, broadly imbricate sepals united at base. Petals firmly coriaceous, triangular, valvate, with punctiform impressions on the outer surface. Stamens 27, the anthers four or five times as long as broad, twice or three times as long as the slender, basally attached filaments.

Female flowers with calyx and corolla similar to those of the male flowers, but larger. Staminodes represented by 9 slender filaments. Pistil large, triangular-obconic or turbinate, the three sessile stigmas grown together into a conic or pyramidal process.

## Family PHYTELEPHANTACEAE.

Inflorescences not branched, those of male plants projecting as long, exposed, flower-covered cylinders, those of female plants shortened into a head.

Spathes of male inflorescences two, sheathing, but short and incomplete; those of female inflorescences very numerous, mostly bract-like, only the two lowest sheathing the spadix.

Male flowers crowded on the spadix; perianth simple, saucer-shaped, irregularly toothed; stamens very numerous, the slender basally attached filaments twice as long as the anthers; pistillodes wanting.

Female flowers with 3 large, narrowly imbricate sepals; petals 5 to 10, longer and narrower than the sepals, and also imbricate; staminodes numerous, with anthers as long as the filaments; carpels several (4 to 9), the stigmas narrowly linear, united for about half their length into a slender style.

Fruits when young with apical stigma scars, with maturity becoming variously lobed and irregular; outer skin thick and corky, soon broken into numerous conical or wart-like frustules.

Seeds several, large; albumen very hard and solid. Embryo basal, covered by a specialized operculum.

Germination similar to that of the genus Attalea of the family Cocaceae, by means of a long cotyledon, carrying the plumule into the ground. Cotyledon followed by two or three bladeless sheaths. First true leaf composed of many separate pinnæ.

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# CONTRIBUTIONS

FROM THE

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## THE TYPE LOCALITIES OF PLANTS FIRST DESCRIBED FROM NEW MEXICO

## A BIBLIOGRAPHY OF NEW MEXICAN BOTANY

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# PREFACE.

The accompanying papers are designed to assist students of the taxonomy and distribution, and to some extent of the ecology, of the New Mexican flora. The first contains an annotated list of all those plants that have their type localities in New Mexico. So far as can be learned no list of this kind has ever been prepared before for any State or Territory, in spite of the obvious advantages which such a work offers. It is interesting to learn that from New Mexico alone almost seven hundred new plants have been described. Accompanying the list of species is a list of localities with the names of the species described from each; and in order to facilitate the finding of the localities, a map of New Mexico has been prepared upon which all the type stations have been conspicuously marked. As an aid in the study of the collections made by some of the earlier botanical explorers of this region notes regarding their itineraries have been collected and tabulated. It has been found necessary in preparing the list of species to form several new binomials; these will be found listed at the end of the paper. The bibliography which forms the second of the papers is intended to be a complete index to the literature of New Mexican botany.

FREDERICK V. COVILLE,
*Curator of the United States National Herbarium.*

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RELIEF MAP OF NEW MEXICO.

# THE TYPE LOCALITIES OF PLANTS FIRST DESCRIBED FROM NEW MEXICO.

By Paul C. Standley.

## INTRODUCTION.

In the endeavor to settle the application of old names it is often of the greatest advantage to know exactly where the specimens from which a certain species was described were collected. This is demonstrated by the difficulty experienced by botanists in determining the proper reference of names based upon plants cultivated in botanical gardens. With specimens from the type locality of a species one can often supplement a scanty type much better than with specimens that are apparently the same, but collected in other localities. When a description is brief and imperfect and no type has been designated, this is often the only method of interpreting the author's meaning.

Unfortunately it is only lately that botanists have come to regard the designation of types and type localities as important. The earlier botanical writers did not consider the practice necessary, underestimating the possible development of systematic botany. They were accustomed to assign their new species to large and often indefinite areas, such as "the eastern coast of North America," "Canada," "west of the Mississippi River," and areas of similar extent. As a result, when it has been found afterwards that there existed a group of closely related species not known to the earlier writer, any of which would fill the original description, it has often been extremely difficult to tell which member of the group was the basis of the proposed name.

Even when the early botanists cite a definite locality or region as the source of their specimens it can not always be accepted implicitly as the type locality, because of later changes in the application of geographical names. Thus Linnaeus credited to Virginia, when that State's territory was larger than at present, plants not known now to occur within its boundaries; and by other writers Louisiana is given as the source of plants collected hundreds of miles north of the present boundaries of the State of that name. These conditions make annotated lists of type localities like the present desirable.

One of the first works in which any attention was paid to the definition of type localities was Coville's Botany of the Death Valley Expedition. Under each species listed there is given the locality in which the original specimen was collected. Piper's Flora of Washington is another example of the same practice, while Miss Alice Eastwood and Prof. A. A. Heller have published similar lists. Dr. A. S. Hitchcock in some of the Contributions from the National Herbarium has done some especially useful work of this kind for the grasses. But, so far as the writer knows, no one has ever prepared a list of the nature of the one here presented. It would be very difficult to make such a compilation for one of the Eastern States because of the obstacles mentioned, but in the case of the newer Western States and Territories conditions are generally different. The larger number of the western plants have been described by the later botanists, Gray, Torrey, Greene, Watson, and others, who usually have assigned a new species to a definite region and often to a certain collection of a particular collector. Doctor Gray hardly considered Wright's numbers which he cites in Plantae Wrightianae as "types" in our sense of the word, but undoubtedly they were the plants chiefly used in drawing up his descriptions, and they may therefore be regarded as the types of his species.

The writer believes that in this list of species described from New Mexico the families from the first of the Bentham and Hooker sequence to the end of the Compositae are rather completely represented, but that some species of the remaining families have probably been overlooked. This results from the fact that in the two principal works dealing with New Mexican botany, Plantae Fendlerianae and Plantae Wrightianae, Doctor Gray treated only the former families. Within them he described most of the new plants in the classic collections of the earlier explorers of the southwestern flora. When we look for the diagnoses of the new species described in the remaining groups, we can find them in no one or two papers, but must look for them in dozens of places scattered all through our botanical literature.

This paper is designed to aid not only the herbarium student of New Mexican botany but collectors in the Territory as well. It will enable the latter to re-collect some of our species at their original stations. To aid them, the localities have been defined as carefully as possible and suggestions have been made in many cases regarding the particular place in a region where a plant is likely to be found. Some of the localities mentioned in the earlier reports are no longer to be found on the map of New Mexico, and special attention has been given to their location. Place names in the Southwest, as in any new country, are continually changing, and it seems worth while to leave a record of some of these changes before they are forgotten.

Under each species in the list, when practicable, are given the type locality, name of collector, type number, and date of collection, and any other data that have seemed important. In addition the writer has attempted to give the accepted name for each species whenever it has been found necessary to transfer it to another genus or when it has been found to be a synonym. Unless otherwise stated, the name listed is, so far as the writer knows, a valid one. No effort has been made to determine whether the numerous names published during the last few years represent good species or not.

In some cases it has been found impossible to assign any definite part of New Mexico as the source of the specimens upon which a new species was based, but such instances are comparatively few. In Plantae Fendlerianae the localities are given with commendable definiteness and in Plantae Wrightianae with almost equal detail.

Two localities in New Mexico are remarkable for the number of plants described from them, Santa Fe and Santa Rita. The reason for this is the fact that the first extensive collections made in the Southwest were made largely at these two places. Although there is hardly a county in New Mexico in which a few new species have not been found, it is not to be inferred that the flora of the Territory has been thoroughly explored and that new plants are no longer to be discovered within its boundaries. This is far from being the case. With but few exceptions the areas that have been best explored are those most easily reached by railroad. In the more remote parts of New Mexico there are hundreds of square miles that have never been visited by any botanical collector. When explored, these will reveal dozens of new plants to swell our list. Even in the best-known regions new plants are continually being found. More collecting has been done in the Organ Mountains than in any other part of the Territory, yet a botanist seldom visits them, limited in extent as they are, without finding something new to their flora.

The number of plants listed here is 690, a truly remarkable number and one that will be exceeded by but few States. California could furnish a much longer list and doubtless also Colorado and Texas, but probably no other State. It would be interesting for the sake of comparison, aside from other considerations, if such lists could be prepared for other States, especially those of the West, and perhaps for some of the eastern ones or for groups of those which together form homogeneous areas.

The following data of New Mexican species will be of interest. Doctor Gray has described more than any other author, 173 in all. Doctor Greene has named almost as many, 171; Doctor Engelmann, 59; Doctor Torrey, 52; Prof. E. O. Wooton, 42; and Prof. T. D. A. Cockerell, 32. There has been hardly a botanist in America engaged

in taxonomic work since the middle forties who has not based one or more of his names upon New Mexican material.

In this list the specific name "*neomexicanum*" occurs rather frequently. Doctor Gray seems to have been responsible for this combination of Greek and Latin forms. The proper adjective, "*novomexicanum*," has been little used. One editor recently even went so far as to object when Professor Wooton used the name "*novomexicanum*," saying that "*neomexicanum*" was "the better or at least more usual."

More than once this name has been mistakenly applied to plants whose types really came from other regions and which in some instances are not known to occur within the Territory. The most glaring example of this is to be found in the case of two species of Juncus named not very long ago; one, *neomexicanus*, was founded upon material from Arizona, while the other, *arizonicus*, was based upon a New Mexican collection. This may have been due to a slip of the pen, otherwise it is inexcusable.

For some cases of the misapplication of this name the authors should not be blamed too harshly. Wright's labels for his collection of 1849 read: "Collected on a journey from San Antonio, Texas, to El Paso, New Mexico." Now, New Mexico at that time was a term which included parts of Chihuahua, Texas, and Arizona, in addition to its present territory. The El Paso thus referred to is not in New Mexico and it is not El Paso, Texas, but the present town of Ciudad Juárez, Chihuahua. No more reliance can be placed upon the heading of Wright's labels for his collections made in 1851–52. The labels of the Mexican Boundary Survey are equally deceptive; they read: "Collected * * * chiefly in the valley of the Rio Grande, below Doñana." As a matter of fact, few of these boundary plants came from New Mexico, most of them having been collected in Texas. As a consequence of the wording of these two sets of labels many new species have been described, which their authors, sometimes through a lack of knowledge of these facts and sometimes through ignorance of the geography of the Southwest, have assigned to New Mexico, when the types really were collected sometimes hundreds of miles outside the Territory's boundaries. Even now it is often impossible for the best informed to tell whether some of Wright's specimens came from New Mexico, from Texas, or from Mexico, outside of the rare instances in which the exact locality happens to be written upon the label.

Some of the plants wrongly accredited to New Mexican territory are referred to in this list, but there are many more that are not mentioned. Sometimes it has been difficult to decide whether a plant was based upon material from New Mexico or from some other State or Territory; some of these cases are discussed here, but

most of them have been neglected because of their comparative unimportance.

The writer wishes to acknowledge his indebtedness to the Gray Herbarium, from which very helpful notes regarding some of Wright's numbers have been received; and to Mrs. Agnes Chase, of the Department of Agriculture, who has given assistance in the preparation of the list of grasses. To Prof. E. O. Wooton, of the New Mexico Agricultural College, without whose aid the list would never have been completed, he is especially indebted for help given at many times in the preparation of the lists of plants and localities.

## ITINERARIES OF EARLY COLLECTORS.

The labels attached to the plants collected by Wright, Bigelow, and others of the earlier collectors are, as every botanist knows, usually very incomplete regarding locality, date of collection, and other details. With a knowledge of the localities visited by a collector and the dates of his visits one can often add much to the data given by a label. To make the needed information more accessible, it has seemed desirable to give here a condensed account of the routes of the more important of the earlier botanical collectors. The facts have been gathered from various sources; sometimes from notebooks and sometimes from geographical or other reports.

### Route of Dr. A. Wislizenus. 1846.

Dr. A. Wislizenus while making a tour of the Southwest for scientific purposes, came into northeastern New Mexico from Kansas and what is now Oklahoma in the summer of 1846. It is uncertain upon what day he crossed into New Mexico. The following details of his route within the Territory are compiled from his published journal.[a]

June 17. Cold Spring to McNees Creek.
18. To Cottonwood Branch and Rabbits Ear Creek.
19. To Rock Creek by Round Mound.
20. Across Whetstone Creek to "Point of Rocks."
21. To the Rio Colorado, "the principal headwaters of the Canadian River."
22. Across Ocaté Creek.
23. To Santa Clara and Wagon Mound.
24. Across Wolf Creek to the Rio Mora.
25. To Gallinas Creek and Las Vegas.
26. Tecolote Abajo to San Miguel.
27. To the Rio Pecos and near the old Pecos ruins.
28. To Cottonwood Branch. (From Wislizenus's description this seems to have been at or near the present town of Glorieta.)

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[a] A. Wislizenus. Memoir of a tour to northern Mexico, connected with Colonel Doniphan's expedition, in 1846 and 1847. 141 pp. Washington, 1848.

June 29. Through Apache Canyon.
30. To Santa Fe.
July 1 to 8. At Santa Fe.
8. Santa Fe to Agua Fria.
9, 10, 11. To the placer mines and through the Sandia Mountains.
12. To Albuquerque.
13 to 16. At Albuquerque.
17. To Sandoval's hacienda.
18. Along the Rio Grande Valley.
19. To a camp opposite Isleta.
20. To Alamos de Pinos and the "hacienda of Mariano Chavez's widow."
21. Chavez to Peralta, Valencia, and Tomé.
22. To Casas Coloradas.
23. Along the Rio Grande.
24. Past Joyita.
25. Joya (La Jolla) and along the Rio Grande.
26. Through Sabino and near Parida.
27. Along the Rio Grande.
28. Opposite Socorro to Lopez.
29. Lopez to the upper end of the Jornada del Muerto.
30. Past Valverde.
31. Along the Jornada near the Rio Grande.
Aug. 1. Past Fray Cristobal (Jornada del Muerto).
2. Past Laguna del Muerto and Ojo del Muerto.
3. Past Alamos to Barilla (Jornada del Muerto).
4. Along the Jornada del Muerto.
5. From a camp on the river at Robledo to Dona Ana.
6. Rio Grande Valley below Dona Ana.
7. To the upper crossing of the Rio Grande.

### Routes of Charles Wright. 1851-1852.

Charles Wright, at the suggestion of Dr. Asa Gray, visited the southwest in 1849 and in 1851–52 for the purpose of making botanical collections. The following notes regarding his collections are taken from a paper published by Prof. E. O. Wooton in the Bulletin of the Torrey Botanical Club:[a]

Practically all the plants of the 1849 collection were gathered in what is now the State of Texas. Wright may have entered what is now New Mexico on the return journey, between October 12 and October 20, but this is quite doubtful, since the party apparently went down the river to San Elezario and then turned eastward.

The plants obtained on the 1851 trip were mostly collected in New Mexico (about Santa Rita), though all the time from September 2 to October 4 was spent on a trip through southeastern Arizona and northeastern Sonora.

Nearly all the plants collected in 1852 were obtained in Texas. He made a ten days' trip to Lakes Gusman and Santa Maria in northern Chihuahua, and another of four or five days to Fort Fillmore and the Organ Mountains, in southern New Mexico.

A new difficulty arises here, since the specimens of the 1851 and 1852 collections were sent out under the same printed label and it is not possible to tell which specimens were collected each year.

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[a] Southwestern localities visited by Charles Wright. Bull. Torrey Club **33**: 561–66. 1906.

The following notes regarding Wright's route in New Mexico were taken from Wright's field notebooks by Professor Wooton:

1851.
July 4–5. Rio Grande bottom above Frontera and at the cottonwoods.
9, 18, and 19. Valley of the Rio Grande below Dona Ana and at Dona Ana.
29. From Dona Ana to San Diego, the crossing of the river.
30. Santa Barbara.
31. From Santa Barbara to Mule Creek and Cooks Spring.
Aug. 1. From Cooks Spring to Mimbres, passing Mimbres Mountains.
2. From Mimbres to Copper Mine Creek.
4–6, 8, 11–13, 15, 18, 19, 20, 22, 23, 26, 27. Copper Mines (along creek, in mountains and ravines near).
28. Apache de hoo[a] and Ojo de Vaca.
29. Near and at Ojo de Gavilan and on toward Condes Camp.
31. From Ojo de Gavilan to Condes Camp and at the latter.
Sept. 1. About Condes Camp.
From this date until October 4 Wright was in Arizona and Mexico.
1851.
Oct. 4, 5. Guadalupe.
5, 6, 7. Valley of the Sierra de las Animas.
7. Las Playas Springs.
8. From Las Playas to Copper Mines.
9, 11, 13, 15–18, 20, 21, 23. Copper Mines (on mountains, hillsides, along the creek, etc.)
25, 27. From Cobre to the Mimbres and along the Mimbres.
28, Nov. 1. Cobre, on hills and along creek.
Nov. 2. Around the hot springs.
2. Bottom of Mimbres and at Cooks Spring.
3. Mule Creek and "Hole in rock."
4, 5, 6. Bottom of Rio Grande.
From this date until April, 1852, Wright was in Texas and Chihuahua.
1852.
Apr. 29. Camp Fillmore.
29, 30. Organ Mountains.

### Route of Whipple's Exploring Expedition. 1853.

This expedition was one sent out by the Federal Government for the purpose of finding a route from the Central States to California. It entered New Mexico from the Panhandle of Texas and after crossing the Territory passed into Arizona. Dr. J. M. Bigelow was the botanist of the expedition and made large collections. Most of his plants were gathered east of Albuquerque, the season, west of this point, having become too late for botanical collecting. Doctor Bigelow later collected in southwestern New Mexico, but the route followed and the dates of collection are not accessible. The following itinerary is taken from the published reports of the expedition:[b]

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[a] Propably Apache Teju.

[b] Route near the thirty-fifth parallel, explored by Lieut. A. W. Whipple, topographical engineers, in 1853 and 1854. Pac. R. Rep. **4:** 1–288+iv. 1856.

| No. of camp. | 1853. |
|---|---|
| 47. Cañada de Truxillo, lat. 35° 6′ 15″, long. 103° 9′ 50″ (just outside New Mexico, if the latitude and longitude are correct) | Sept. 19 |
| 48. Branch Tucumcari Creek | Sept. 20 |
| 49. Tucumcari Creek | Sept. 21 |
| 50. Laguna Colorado | Sept. 22 |
| 51. Arroyo Cuerbito | Sept. 23 |
| 52. Hurrah Creek | Sept. 24–25 |
| 53. Sheep Spring | Sept. 26 |
| 54. Anton Chico | Sept. 27–28 |
| 55. Cañon Blanco | Sept. 29 |
| 56. Laguna Blanco | Sept. 30 |
| 57. San Pedro Pass | Oct. 1 |
| 58. San Antonio | Oct. 2 |
| 59. Albuquerque | Oct. 3–Nov. 6 |
| 60. Atrisco | Nov. 8 |
| 61. Isleta | Nov. 11 |
| 62. Rio Puerco | Nov. 11 |
| 63. Rio San José | Nov. 11–12 |
| 64. Covero (properly spelled Cubero) | Nov. 14 |
| 65. Hay Camp | Nov. 15 |
| 66. Sierra Madre | Nov. 16 |
| 67. Agua Fria | Nov. 17 |
| 68. Inscription Rock | Nov. 18 |
| 69. Ojo del Pescado | Nov. 19 |
| 70. Zuni River | Nov. 21–25 |
| 71. Arch Spring | Nov. 26–27 |
| 72. Cedar forest | Nov. 28 |

One or the other of these last two (it is not clear which) was the last camp in New Mexico.

### Route of Pope's Expedition.[a] 1854.

Like Whipple's expedition, Pope's had for its purpose the discovery of a route between the Central States and the West. The company started eastward from El Paso in February of 1854. The party was in New Mexico for only a short time, and on account of the earliness of the season collected only a few plants in the Territory, most of the collections being made in Texas. The name of the botanical collector is not given, but the plants are usually considered as collected by the commander of the expedition.

Feb. 23. Plain (in New Mexico just above the Hueco Tanks, which are in Texas).
24. Cotton Wood Spring.
25. Thorns Wells (Los Cornudos).
26. Plain.

From February 26 until March 25 the party was in Texas; then their route led them northward and they crossed the southeastern corner

[a] Report of exploration of a route for the Pacific Railroad near the thirty-second parallel of north latitude from the Red River to the Rio Grande, by Brevet Captain John Pope, Corps of Topographical Engineers. Pac. R. Rep. **2⁴:** 1–185. 1854.

of New Mexico. Part or all of the following camps were in New Mexico:

Mar. 25. Llano Estacado.
26. Sand hills.
27. Llano Estacado.
28. Llano Estacado.

### Route of Parke's Exploring Expedition.[a] 1854.

The purpose of this expedition was similar to that of the two just described. Parke's company came into New Mexico from Arizona in 1854, going to El Paso by way of the Copper Mines and Fort Fillmore. The latter is now an abandoned military post in the Mesilla Valley, about 8 miles south of Las Cruces. The plants collected on this expedition were gathered by Dr. Thomas Antisell, the geologist of the expedition. The party was in New Mexico on the following dates:

| No. of camp. | 1854. |
|---|---|
| 82. El Peloncillo | Aug. 4 |
| 82. Dry laguna | Aug. 5–6 |
| 83. Penasquitas | Aug. 7 |
| 84. Ojo de Vaca | Aug. 7–8 |
| 85. Left bank of Rio Mimbres | Aug. 9–10 |
| 86. Cooks Spring | Aug. 11–12 |
| 87. Mesilla Valley near the Rio Grande | Aug. 12 |
| 89. Near Fort Fillmore | Aug. 21 |

The party remained at Fort Fillmore for some time, but no plants seem to have been collected there.

## DESCRIPTIVE LIST OF TYPE LOCALITIES.

All the localities mentioned in the list of species are included here, except in cases where it seems impossible to fix the type locality exactly. Unless otherwise mentioned, all the localities will be found upon the accompanying map.[b] Under each locality is given a list of the plants that have been described from specimens gathered there.

**Albuquerque.** Altitude, 1,500 meters. **F5.**

The largest town of New Mexico, in the central part of Bernalillo County, on the east bank of the Rio Grande. Doctor Wislizenus, Dr. J. M. Bigelow, Dr. C. L. Herrick, Prof. T. D. A. Cockerell, and perhaps others, have botanized here.

*Corispermum marginale.*
*Dalea scariosa.*
*Gnaphalium strictum.*
*Heliotropium xerophilum.*
*Opuntia clavata.*
*Parryella filifolia.*

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[a] Report of explorations for that portion of a railroad route, near the thirty-second parallel of north latitude, lying between Dona Ana, on the Rio Grande, and Pimas villages, on the Gila, by Lieut. John G. Parke, Corps of Topographical Engineers, Pac. R. Rep. **2**[5]: 1–28. 1854.

[b] The letters and figures at the right refer to the map.

**Animas Creek.** **D9.**

A small stream at the south end of the Black Range, running north and west of Hillsboro, in Sierra County, toward the Rio Grande. Mr. O. B. Metcalfe collected here in 1904.

*Acacia constricta paucispina.* *Meibomia metcalfei.*

**Anton Chico.** Altitude, 1,625 meters. **I5.**

A small Mexican settlement on the Pecos River in the extreme northwestern corner of Guadalupe County. The only botanist who has ever visited the place was Doctor Bigelow, in 1853.

*Cereus phoeniceus conoideus.* *Opuntia engelmanni cyclodes.*

**Aztec.** Altitude, 1,700 meters. **C1.**

The principal town of San Juan County, in the northern part of that county. Mr. C. F. Baker collected here in 1899.

*Amelanchier crenata.*
*Amelanchier rubescens.*
*Arabis formosa.*
*Astragalus oocalycis.*
*Cheiranthus aridus.*
*Erigeron setulosus.*
*Lithospermum oblongum.*
*Lupinus aduncus.*
*Lupinus ammophilus.*
*Oreocarya lutescens.*

**Barranca.** Altitude, 2,100 meters. **G2.**

A small Mexican town, in the southwestern part of Taos County, near the Rio Grande. Prof. A. A. Heller collected near here in 1897.

*Pentstemon caudatus.*

**Bear Mountain.** Altitude, 2,450 meters. **B9.**

A peak standing a few miles northwest of Silver City, in Grant County. Dr. E. L. Greene and Mr. O. B. Metcalfe have collected in this locality. There are, however, several other peaks of this name in New Mexico.

*Echinospermum ursinum.* *Rhamnus ursina.*
*Mimulus cordatus.*

**Ben Moore.** **C10.**

This name was applied by Lieutenant Emory to a peak in the Mimbres country, near Santa Rita, in honor of a friend. The name is no longer in use. Besides Lieutenant Emory, Wright seems to have collected here.

*Mamillaria aggregata.* *Pedicularis centranthera.*

**Beulah.** Altitude, 2,400 meters. **H3.**

A post-office on the Rio Sapello, near the eastern edge of the Pecos River National Forest, in the northwestern part of San Miguel County. Prof. T. D. A. Cockerell has collected here at various times.

*Clematis occidentalis albiflora.* *Humulus lupulus neomexicanus.*
*Delphinium sapellonis.* *Viola wilmattae.*

**Black Range.** **C9.**

A range of mountains running north and south in the western part of Sierra and the northeastern part of Grant County. The highest peaks reach an altitude of about 3,100 meters. Mr. O. B. Metcalfe made a large collection about the south end of the range in the summer of 1904 and the spring of 1905.

*Acacia constricta paucispina.*
*Antennaria anacleta.*
*Bidens cognata.*
*Callisteris formosissima.*
*Chaptalia alsophila.*
*Coleosanthus axillaris.*
*Disaccanthus luteus.*
*Drymaria depressa.*
*Helianthella majuscula.*
*Heuchera versicolor.*
*Ionoxalis monticola.*
*Meibomia metcalfei.*
*Pectis taxifolia.*
*Phlox mesoleuca.*
*Ptelea neomexicana.*
*Silene concolor.*
*Sophia obtusa.*
*Sophia serrata.*
*Townsendia formosa.*
*Toxicodendron punctatum.*

**Burro Mountains.** **B9.**

A small range west and southwest of Silver City, in Grant County, the highest peaks reaching an elevation of about 2,415 meters. The range was visited by Thurber and by Parke's expedition. Dr. H. H. Rusby was here in 1881 and Mr. O. B. Metcalfe in the summer of 1903.

*Hymenoxys metcalfei.*
*Obione acanthocarpa.*
*Panicum lachnanthum.*
*Pentstemon thurberi.*
*Ptelea undulata.*
*Ranunculus nudatus.*

**Cañoncito.** Altitude, 2,060 meters. **G4.**

A station on the Santa Fe Railroad, in the eastern part of Santa Fe County, southeast of Santa Fe. Prof. A. A. Heller visited the locality in the summer of 1897. The type of *Mentzelia parviflora* was collected between here and Santa Fe.

**Cañon Largo.** **D2.**

A canyon tributary to the San Juan River, in the eastern part of San Juan and the western part of Rio Arriba County. Doctor Newberry visited the region in the early fifties.

*Chrysothamnus newberryi.*

**Capitan Mountains.** **H8.**

A range in the south central part of Lincoln County. Its highest peak is about 3,000 meters. F. S. and Esther E. Earle collected here during the summer of 1900. Miss Josephine Skehan collected in the same region, especially about Gray, in 1898.

*Coleosanthus modestus.*
*Mirabilis linearis subhispida.*
*Mirabilis oxybaphoides glabrata.*
*Solidago aureola.*

**Chama.** Altitude, 2,360 meters. **F1.**

A small town in the northern part of Rio Arriba County, on the Denver and Rio Grande Railroad. Mr. C. F. Baker collected here in 1899. Mr. George E. Osterhout seems to have visited the place also.

*Allium sabulicola.*
*Chrysothamnus bakeri.*
*Grindelia subincisa.*
*Lupinus ingratus.*

**Cimarron River.** **M1.**

That part of the stream which is in New Mexico is in Union County in the extreme northeastern part of the Territory. Wislizenus and Fendler crossed the river on their way to and from Santa Fe, following one of the routes of the Santa Fe Trail. Doctor Wislizenus speaks of several branches of the stream. *Talinum calycinum* was collected by Wislizenus along the Cimarron, but whether in New Mexico or elsewhere one is unable to tell.

**Cliff.** Altitude, 1,360 meters. **B9.**

A post-office on the Gila River in the northern part of Grant County northwest of Silver City. Mr. O. B. Metcalfe and Mr. J. G. Smith have collected here.

*Sitanion caespitosum.*

**Cloudcroft.** Altitude, 2,700 meters. **H9.**

A small town, prominent as a summer resort, on the summit of the Sacramento Mountains in central Otero County. Prof. E. O. Wooton has collected here at various times.

*Polemonium pterospermum.*
*Rosa neomexicana.*

**Cobre.**

See Santa Rita.

**Condes Camp.**

In the western part of Grant County near the Arizona boundary, visited by Wright.

*Anoda pentaschista.*
*Cucurbita digitata.*
*Galactia tephrodes.*

**Cooks Spring.** Altitude, 2,250 meters. **D10.**

An old ranch, well known in the early days as a watering place, was located here in the extreme northern part of Luna County. Doctor Bigelow and perhaps others of the early botanists collected here.

*Gilia bigelovii.*
*Pentstemon dasyphyllus.*

**Copper Mines.**

See Santa Rita.

**Del Norte.**

See Rio Grande.

**Deming.** Altitude, 1,290 meters. **D11.**

A town in the central part of Luna County of which it is the county seat. *Sphaeralcea simulans* was collected on the surrounding plains by Professor Wooton.

**Dog Spring.** **B12.**

Or Ojo del Perro, in the southeastern corner of Grant County near the Mexican boundary line. E. A. Mearns visited the place while making collections along the Mexican boundary.

*Hymenoxys chrysanthemoides mearnsii.*

**Dona Ana.** Altitude, 1,170 meters. **E10.**

A small Mexican settlement standing on the mesa between 1 and 2 miles east of the Rio Grande in Dona Ana County, a few miles north of Las Cruces. It is one of the oldest settlements in southern New Mexico and the only one in this part of the country mentioned by Wislizenus which is now in existence. All the plants that have their type localities here were collected by that explorer, but Prof. E. O. Wooton has collected in the vicinity frequently.

*Echinocactus wislizeni.*
*Mamillaria macromeris.*
*Maurandia wislizeni.*
*Opuntia filipendula.*
*Phaseolus angustissimus.*

**Eagle Creek.** **H8.**

A small stream in the White Mountains in the southern part of Lincoln County, flowing eastward into the Rio Ruidoso. Professor Wooton collected here in 1897 as well as at other times. Gilmores Ranch, mentioned elsewhere, is on this stream.

*Aster hesperius wootonii.*
*Philadelphus argyrocalyx.*
*Scrophularia montana.*

**Elizabethtown.** Altitude, 2,540 meters. **H2.**

A small town in the extreme western part of Colfax County. Mrs. O. St. John made a small collection of plants in the vicinity a few years ago.

*Delphinium cockerellii.*

**Espanola.** Altitude, 1,670 meters. **G3.**

A Mexican town on the Rio Grande in the extreme southeastern part of Rio Arriba County, on the Denver and Rio Grande Railroad north of Santa Fe. Prof. A. A. Heller collected a few plants here in 1897.

*Hymenopappus arenosus.*

**Florida Mountains.** Altitude, 2,190 meters. **D11.**

A small, narrow range of steep peaks in the central part of Luna County southeast of Deming. Dr. C. L. Herrick of the University of New Mexico collected here in the late nineties and Mr. E. A. Goldman of the Biological Survey in the autumn of 1908.

*Gutierrezia goldmanii.*

**Fort Bayard.** Altitude, 1,850 meters. **C9.**

Formerly a military post, now maintained by the Government as a sanitarium for tuberculosis patients, in the eastern part of Grant County between Silver City and Santa Rita. Dr. E. L. Greene botanized in the region in the early eighties, and Mr. J. C. Blumer made a small collection of plants here a few years ago.

*Ptelea subvestita.*

**Fort Wingate.** Altitude, 2,000 meters. **B4.**

The only military post now occupied in New Mexico, in McKinley County a few miles southeast of Gallup. Dr. W. Matthews, a surgeon connected with the post, collected here in 1882.

*Astragalus matthewsii.*
*Astragalus procumbens.*
*Astragalus wingatanus.*

**Fray Cristobal.** **E8.**

According to Doctor Wislizenus, who passed by here in 1846, this was a name of rather loose application given to a place on the east side of the Rio Grande in southeastern Socorro or northeastern Sierra County, about 40 miles below the town of Socorro. It was the last camp before starting across the Jornada del Muerto. There is a peak of this name just east of the river in the extreme northeastern corner of Sierra County, and it is probably the peak rather than the surrounding country to which the name really was applied.

*Dithyraea wislizeni.*
*Larrea glutinosa.*

**Fresnal.** Altitude, 1,950 meters. **G9.**

A post-office in the Sacramento Mountains, in the north-central part of Otero County, between Highrolls and Tobogan. It is now known as Wootens. Prof. E. O. Wooton has collected here at various times.

*Ribes mescalerium.*

**Frisco.** Altitude, 1,670 meters. **A8.**

A small settlement in the western part of Sierra County, in the Gila National Forest, on the San Francisco or, as it is more commonly called, the Frisco River. Professor Wooton has botanized here and in the surrounding region.

*Juniperus megalocarpa.*
*Sphaeralcea laxa.*

**Galisteo.** Altitude, 1,820 meters. **G4.**

A Mexican town on the Santa Fe Railroad in the south-central part of Santa Fe County. Doctor Bigelow is the only botanist who ever visited the place, passing by it in 1853.

*Abronia bigelovii.* *Eriogonum effusum nudicaule.*

**Gallinas River.** **H4.**

A stream which rises in the southeastern part of the Pecos River National Forest and flows past Las Vegas southeastward into the Pecos River. *Ribes leptanthum veganum* was collected along its banks by Professor Cockerell.

**Georgetown.** Altitude, 1,940 meters. **C9.**

A now abandoned mining camp in southwestern Grant County, near Santa Rita. Dr. E. L. Greene collected here in the early eighties.

*Lithospermum viride.*

**Gila River.** **B9.**

One of the more important streams of New Mexico, having its source in the Gila National Forest in Socorro County. It is formed by the union of three branches, the East, West, and Middle forks. It flows through the northwestern part of Grant County and into Arizona. Various botanists have collected in the region, Lieutenant Emory being the first. Dr. E. L. Greene, Professor Wooton, and Mr. O. B. Metcalfe have botanized along the stream and its branches.

*Androsace glandulosa.*
*Astragalus gilensis.*
*Delphinium scaposum.*
*Erigeron deustus.*
*Euphorbia neomexicana.*
*Hymenoclea monogyra.*
*Megarrhiza gilensis.*
*Opuntia stanlyi.*
*Pentstemon pauciflorus.*
*Senecio mogollonicus.*
*Senecio prionophyllus.*

**Gilmores Ranch.** Altitude, 2,220 meters. **H8.**

A ranch in the White Mountains of Lincoln County near the post-office of Alto, on Eagle Creek. Prof. E. O. Wooton made an extensive collection here in 1897, and he and the writer collected two or three hundred numbers here in 1907. Mr. A. B. Turner collected several hundred plants at the same station in 1899. The plants that have their type localities here will all be found listed for the White Mountains.

**Gray.** **H8.**

A small settlement on or very near the present site of Capitan, in Lincoln County. It was in what is called the "Salow" (Salado), a wide, open "draw" or valley east of Carrizozo and north of Nogal, that drains into the Bonito. It is about 4 miles from Fort Stanton.

*Argemone squarrosa.*
*Coleosanthus nepetaefolius..*
*Gutierrezia juncea.*
*Gutierrezia linearis.*
*Ionoxalis caerulea.*
*Lesquerella valida.*

**Hanover Hills.** **C9.**

A term applied, evidently, to hills or low mountains in the vicinity of Hanover, a small mining camp near Santa Rita. *Hymenoxys olivacea* was collected here by Miss A. I. Mulford.

**Harrisons Ranch.** Altitude, 2,120 meters. **H4.**

The ranch thus referred to is on the west bank of the Pecos River, about three-fourths of a mile below the village of Pecos. The writer gathered several hundred numbers here in August of 1908. Professor Cockerell has collected in the vicinity as well.

*Ratibida tagetes cinerea.*

**Harveys Ranch.** Altitude, 2,880 meters. **H4.**

In the Las Vegas Mountains, in the southeastern part of the Pecos River National Forest in San Miguel County. Professor Cockerell visited the place several times; Prof. F. H. Snow and Professor Dyche of Kansas University have collected here; and the writer collected about a hundred numbers at this station in August, 1908.

*Calochortus gunnisonii perpulcher.* *Sidalcea candida tincta.*

**Hillsboro.** Altitude, 1,530 meters. **D9.**

A small town in the western part of Sierra County, of which it is the county seat. Mr. O. B. Metcalfe collected here in 1904 and 1905.

*Evolvulus oreophilus.*

**Hurrah Creek.** **J5.**

A small stream in the northern part of Guadalupe County visited by Doctor Bigelow on September 24 and 25, 1853. The name is not to be found on any recent map. In the report of Whipple's expedition the altitude of the camp here is given as 5,047 feet (1,510 meters).

*Teloxys cornuta.*

**Inscription Rock.** Altitude, 2,170 meters. **B5.**

This, sometimes known as El Moro, is in the northwestern part of Valencia County, about 18 or 20 miles east of Zuni. It is a sandstone cliff or rock at whose base is a spring. Since it is the only watering place for miles around it has been a favorite halting place for travelers for hundreds of years. In the soft rock many of the visitors have carved their names, accompanied by various data, hence the English name. It has been visited by several botanists, Doctor Bigelow, Doctor Woodhouse, Professor Wooton, and perhaps others.

*Frasera paniculata.* *Opuntia brachyarthra.*

*Opuntia angustata.*

**Iron Creek.** **D9.**

A small stream in the southern end of the Black Range, a station visited by Mr. O. B. Metcalfe in 1904. It is not shown on the map.

*Ionoxalis monticola.* *Lappula leucantha.*

**Jornada del Muerto.** Altitude from 1,070 to 1,410 meters. **E9.**

The term applied to the plain lying east of the Rio Grande in Socorro, Sierra, and Dona Ana counties. The area is a sandy plain with but scanty vegetation and with no water. The name translated is "the day's journey of the dead man," and various tales are told explaining how it received this appellation, which alludes, no doubt, to the desolation of the region. The journey across this stretch of desert was much feared by the early travelers along the Rio Grande, for here they were obliged to leave the rough banks of the river and proceed without water for about ninety miles. Doctor Wislizenus was the first botanist who visited this interesting region. Prof. E. O. Wooton and others connected with the Agricultural College have collected extensively about the south end of the Jornada during the last few years. Dona Ana lies at the south end of the plain and those plants which have their type localities there might be listed here.

*Asclepias arenaria.*
*Dalea scoparia.*
*Fouquieria splendens.*

**Kingston.** Altitude, 1,950 meters. **D9.**

A mining camp in the Gila National Forest in western Sierra County. Mr. O. B. Metcalfe made this his headquarters in 1904 and 1905 in making his Black Range collection.

*Androsace platysepala.*
*Argemone pleiacantha.*
*Ditaxis cyanophylla.*
*Hedeoma pulchella.*
*Malvastrum digitatum.*
*Sicyos ampelophyllus.*
*Sphaeralcea tripartita.*

**Laguna.** Altitude, 1,740 meters. **D5.**

One of the oldest, largest, and best known of the southwestern Indian pueblos, in the northeastern part of Valencia County, near the Santa Fe Railroad. Mr. and Mrs. J. G. Lemmon seem to have collected about the village.

*Talinum brachypodum.*

**Laguna Colorado.** **J5.**

In the southern part of San Miguel County, visited by Bigelow on September 22, 1853. The name seems to have been applied to a small stream in this vicinity.

*Tricuspis mutica.*

**Las Cruces.** Altitude, 1,160 meters. **E10.**

In the central part of Dona Ana County, of which it is the county seat, about 2 miles east of the Rio Grande. Various collectors have gathered plants here—Mr. G. R. Vasey in 1881, Dr. C. L. Herrick, Professor Wooton, and several others. The "Mesa near Las Cruces" and "Mesa west of the Organ Mountains," referred to upon numerous

labels accompanying New Mexican plants, is the sandy plain lying between Las Cruces and the Organ Mountains.

*Abronia carnea.*
*Astragalus wootoni.*
*Fallugia paradoxa acuminata.*
*Kallstroemia brachystylis.*
*Phacelia intermedia.*

**Las Playas Springs.** Altitude, about 1,420 meters. **B11.**

In the south-central part of Grant County. Wright passed by here in 1851.

*Aster blepharophyllus.*
*Eryngium sparganophyllum.*

**Las Vegas.** Altitude, 1,915 meters. **I4.**

One of the largest and oldest towns in New Mexico, in the northwestern part of San Miguel County. It was a station on the Santa Fe Trail, consequently Wislizenus and Fendler stopped here. Professor Cockerell, while connected with the Normal University, made collections in the vicinity.

*Arenaria fendleri.*
*Astragalus simulans.*
*Drymaria tenella.*
*Malvastrum cockerellii.*
*Rosa suffulta.*
*Xanthium commune wootoni.*

**Las Vegas Hot Springs.** Altitude, 2,010 meters. **H4.**

On the Gallinas River in San Miguel County, a few miles northwest of Las Vegas. Collections have been made here by G. R. Vasey, F. H. Snow, Professor Cockerell, and others.

*Quercus rydbergiana.*

**Las Vegas Mountains.** **H4.**

The term applied to the east ridge of the southern prolongation of the Sangre de Cristo Range. These mountains lie in the northwestern corner of San Miguel County, extending perhaps into Mora County. They lie just east of the Santa Fe Range. They get their name from the city of Las Vegas, which lies about 20 miles to the southeast. Their highest peaks have an elevation of about 3,450 meters. The collectors here have been the same as at Las Vegas Hot Springs, Harveys Ranch, and Las Vegas.

*Acer neomexicanum.*
*Aragallus pinetorum veganus.*
*Primula angustifolia helenae.*
*Pseudocymopterus montanus multifidus.*
*Rhus sorbifolia.*
*Thelypodium vaseyi.*

**Llano Estacado.** **M8.**

This, or the English equivalent, Staked Plains, is the name given to the high plateau of eastern New Mexico and northwestern Texas. The region is thus referred to by Doctor Bigelow. Most of his plants reported from the Llano Estacado were Texan. Pope passed over the plateau, but his plants, like Bigelow's, were collected principally in Texas.

*Pentstemon fendleri.*
*Phacelia popei.*

**Luna.** Altitude, 2,250 meters. **A7.**

In the western part of Socorro County, near the Arizona line. Professor Wooton has visited the place once or twice.

*Carex agrostoides.*

**Mangas Springs.** **B9.**

Or Mangas, a small settlement in the northern part of Grant County, northwest of Silver City. Mr. O. B. Metcalfe collected several hundred numbers in the vicinity in the summer of 1903, and his father, Mr. J. K. Metcalfe, has forwarded plants from this locality to the Department of Agriculture at different times. Two other botanists, Professor Wooton and Mr. J. G. Smith, have visited the place.

*Allionia gracillima filifolia.*
*Bromus porteri frondosus.*
*Cedronella rupestris.*
*Hoffmanseggia falcaria rusbyi.*
*Hymenoxys chrysanthemoides juxta.*
*Lepidium intermedium pubescens.*
*Sphaeralcea leiocarpa.*

**Mescalero Agency.** Altitude, 1,940 meters. **G9.**

The agency of the Mescalero Apache Reservation in northeastern Otero County. The agency buildings are near Tularosa Creek, in the eastern part of the reservation, and the post-office here is known as Mescalero. Part of Professor Wooton's White Mountains plants collected in 1897 were gathered here, and he has collected in the vicinity at other times.

*Berberis haematocarpa.*
*Lepidium eastwoodiae.*
*Rosa mirifica.*
*Verbena perennis.*

**Mesilla.** Altitude, 1,155 meters. **E10.**

An old Mexican town in Dona Ana County in the Rio Grande Valley, 2 or 3 miles southwest of Las Cruces. Part of Professor Wooton's 1897 collection was gathered here and several others have collected at the same station.

*Abronia torreyi.*
*Erigeron arenarius.*
*Schmaltzia leiocarpa.*
*Sphaeralcea lobata.*

**Mesilla Park.** Altitude, 1,160 meters. **E10.**

A station on the Santa Fe Railroad in Dona Ana County, 3 miles south of Las Cruces. The Agricultural College, which has been the headquarters for practically all the botanical work done in New Mexico during the last twenty years, is located a little less than a mile to the east. Professors Wooton and Cockerell have collected the types of the following plants here:

*Cryptanthe dicarpa.*
*Fallugia micrantha.*
*Sophia andrenarum*
*Sophia andrenarum osmiarum.*
*Sophia halictorum.*
*Sophia ochroleuca.*

**Mesilla Valley.** **E10.**

That part of the Rio Grande Valley lying within Dona Ana County is designated thus. All those plants having their type localities at Mesilla, Mesilla Park, Las Cruces, or in the valley near Dona Ana might be listed here.

**Mimbres Mountains and River.** **C9 and 10.**

The Mimbres Mountains lie just south of the Black Range in the eastern part of Grant County. The river of the same name rises in the southern end of the Black Range and flows southward through eastern Grant and northern Luna counties until it finally is lost in the sand. The region was visited by Lieutenant Emory in 1847, later by Thurber, Bigelow, and Wright, and in more recent years by most of those who have botanized in southwestern New Mexico.

*Alnus oblongifolia.*
*Asclepias involucrata.*
*Delphinium scopulorum.*
*Robinia neomexicana.*
*Salvia henryi.*
*Urtica gracilenta.*

**Mogollon Mountains.** **B8.**

An extensive range lying in southwestern Socorro County and included within the Gila National Forest. It contains the headwaters of the Gila River. Mr. O. B. Metcalfe collected extensively in the range in the summer of 1903. Doctor Greene and Dr. H. H. Rusby collected here in the early eighties, and Professor Wooton has visited the range several times.

*Astragalus mogollonicus.*
*Ceanothus mogollonicus.*
*Cerasus crenulata.*
*Crataegus wootoniana.*
*Dalea urceolata.*
*Disaccanthus mogollonicus.*
*Draba mogollonica.*
*Draba pallida.*
*Erigeron rusbyi.*
*Gentiana rusbyi.*
*Hieracium brevipilum.*
*Hieracium rusbyi.*
*Hymenopappus integer.*
*Pedicularis angustissima.*
*Pedicularis mogollonica.*
*Potentilla subviscosa.*
*Primula rusbyi.*
*Rhamnus betulaefolia.*
*Ribes mogollonicum.*
*Senecio cardamine.*
*Senecio cynthioides.*
*Senecio mogollonicus.*
*Senecio prionophyllus.*
*Senecio rusbyi.*
*Zygadenus porrifolius.*

**Mora River.** **J3.**

A stream in the southern part of Mora County is the one referred to in this paper. There is another of the same name not far distant in the Pecos River National Forest, but the two, although in the same general region, flow in different directions into different streams. Fendler collected the following plants here:

*Amauria dissecta.*
*Clavigera brachyphylla.*
*Geranium fremontii.*

**Nutt.** Altitude, 1,410 meters. **D10.**

A station on the Santa Fe Railroad in the extreme northeastern corner of Luna County. Mr. O. B. Metcalfe visited the locality in the spring of 1905.

*Phacelia similis.*

**Ocaté Creek.** **I3.**

A small stream in the northern part of Mora County, visited by Wislizenus and Fendler.

*Aster fendleri.*

**Ojo Caliente.** **A5.**

A small settlement on the Zuni Reservation in the extreme northwestern corner of Valencia County. Ojo Caliente is Spanish for Hot Spring, and there are many such springs in New Mexico known by this name. The one near Zuni is the one referred to in the present paper. Professor Wooton seems to be the only botanist who has collected here.

*Tripterocalyx wootonii.*

**Ojo de Gavilan.** **A11.**

Or Hawk Spring, in central Grant County, visited by Wright in 1851.

*Anoda pentaschista.* *Machaeranthera tanacetifolia humilis.*

**Ojo del Muerto.** **E9.**

Wislizenus speaks of this as a place upon the Jornada del Muerto where water was sometimes found. He collected here the type of *Sphaeralcea incana dissecta.*

**Ojo de Vaca.** Altitude, 1,500 meters. **C10.**

Or Cow Spring, in the extreme northwestern corner of Luna County, visited by Wright in 1851.

*Astragalus vaccarum.*

**Olla.**

Formerly a Mexican settlement somewhere near the upper end of the Jornada del Muerto. Wislizenus uses the locality on some of his labels. This, like more than one of the place names used by Wislizenus on his labels, is not mentioned in his journal.

*Larrea glutinosa.*

**Organ Mountains.** Altitude, 2,695 meters. **F10.**

A small range of jagged peaks, running north and south in the southern part of Dona Ana County, about 13 miles east of the Rio Grande. The range contains the steepest and roughest peaks to be found in New Mexico. Both Bigelow and Wright collected here, but they apparently obtained only a few plants. Parke's expedition

visited the range but seems to have gathered no botanical specimens. In 1881 Mr. G. R. Vasey visited the Organs. During the last twenty years Prof. E. O. Wooton and others from the Agricultural College have collected hundreds of plants in the mountains at all seasons of the year, so that this range is better known botanically than any other in the Territory.

*Actinella vaseyi.*
*Allium neomexicanum.*
*Apocynum laurinum.*
*Aquilegia chrysantha.*
*Artemisia microcephala.*
*Astragalus bigelovii.*
*Astragalus tephrodes.*
*Boerhaavia organensis.*
*Boerhaavia viscosa oligadena.*
*Castilleja integra.*
*Castilleja organorum.*
*Chaetochloa grisebachii ampla.*
*Chrysopsis fulcrata.*
*Cirsium neomexicanum.*
*Coleosanthus melissaefolius.*
*Coleosanthus wootoni.*
*Commelina crispa.*
*Delphinium wootoni.*
*Eriogonum abertianum neomexicanum.*
*Erigonum polycladon crispum.*
*Gomphrena caespitosa.*
*Gutierrezia glomerella.*
*Heuchera leptomeria.*
*Laphamia cernua.*
*Lepidium intermedium.*
*Lotus mollis.*
*Martynia parviflora.*
*Mimulus rubellus.*
*Pentstemon linarioides.*
*Phlox speciosa stansburyi.*
*Ptelea villosula.*
*Rhus trilobata mollis.*
*Rosa stellata.*
*Sedum wootonii.*
*Selaginella rupincoa.*
*Sicyos glaber.*
*Verbena confinis.*

**Pecos.** Altitude, 2,100 meters. **H4.**

The small Mexican village of Pecos is in western San Miguel County on the Rio Pecos, a few miles above the crossing of the Santa Fe Railroad. It is near the old Santa Fe Trail and is often mentioned by travelers along that thoroughfare. About 2 miles to the south are the ruins of the old pueblo of Pecos, one of the largest pueblos in the southwest. Both Wislizenus and Fendler passed near here and collected in the vicinity. Prof. T. D. A. Cockerell and the writer have botanized here, the latter in the summer of 1908. The old pueblo gave its name to the Pecos River, which has its source in the mountains about 30 miles to the north.

*Corallorhiza grabhami.*
*Orobanche xanthochroa.*
*Rosa pecosensis.*
*Rosa praetincta.*

**Pecos Baldy.** Altitude, 3,810 meters. **H3.**

One of the highest peaks of the Territory, in the Pecos River National Forest, probably in the extreme southeastern corner of Rio Arriba County, although the boundaries of the several counties whose corners meet here are not very definitely located. Mr. Vernon Bailey, Mrs. W. H. Bartlett, and the writer have collected here. (This is given on the map as Cone Peak.)

*Aconitum robertianum.*
*Thalictrum cheilanthoides.*

**Picacho Mountain.** Altitude, 1,445 meters. **E10.**

A low isolated peak on the west side of the Rio Grande, a short distance north of Las Cruces, Dona Ana County. Professors Wooton and Cockerell have visited the peak.

*Sphaeralcea martii.*

**Pinos Altos.** Altitude, 2,055 meters. **C9.**

A small town in the northeastern part of Grant County, northeast of Silver City. Dr. E. L. Greene has collected extensively here and in the surrounding country.

*Asclepias quinquedentata neomexicana.*

**Pinos Altos Mountains.** Altitude, 2,440 meters. **C9.**

A range in the southern part of the Gila National Forest in northern Grant County. Doctor Greene gathered many plants here in the early eighties.

*Artemisia franserioides.*
*Cerastium fastigiatum.*
*Draba pinetorum.*
*Echinospermum pinetorum.*
*Habenaria brevifolia.*
*Hieracium carneum.*
*Linum neomexicanum.*
*Oldenlandia greenei.*
*Phaseolus parvulus.*
*Polemonium filicinum.*
*Polemonium flavum.*
*Talinum confertiflorum.*
*Talinum humile.*
*Tradescantia tuberosa.*

**Poñi Creek.** **I2.**

In Colfax County between the Rayado and the south fork of the Cimarron; visited by Fendler in 1847.

*Bidens tenuisecta.*
*Franseria tenuifolia.*

**Raton.** Altitude, 1,810 meters. **J1.**

A town on the Santa Fe Railroad in northern Colfax County, not far from the Colorado line. The Raton Mountains, rising to an elevation of about 2,500 meters, are on the line between Colorado and New Mexico, and unless the State in which plants from the range are gathered is mentioned one can not tell whether they are from New Mexico or Colorado. Lieutenant Abert and Mr. S. M. Tracy have collected here.

*Actinella depressa pygmaea.*
*Poa tracyi.*

**Rio Blanco.** **C2.**

A tributary of Cañon Largo, in eastern San Juan County, visited by Doctor Newberry.

*Eriogonum lonchophyllum.*

**Rio Grande.** **G2, D8.**

The principal stream of the southwest, flowing southward through the central part of New Mexico. Its valley has always been an important thoroughfare and several botanists traveling through New Mexico have collected along it. The following plants have been

collected in various parts of its valley; others collected in definite parts of the valley are mentioned under their proper localities. The full name of the stream is the Rio Grande del Norte, and it is sometimes referred to, especially by the earlier explorers, as the Del Norte or the Rio del Norte.

*Atriplex expansa.*
*Baileya multiradiata.*
*Bartonia multiflora.*
*Chondrosium eriopodum.*
*Chondrosium foeneum.*
*Dieteria asteroides.*
*Ephedra trifurca.*
*Eriogonum abertianum.*
*Euploca grandiflora.*
*Fraxinus velutina.*
*Gilia multiflora.*
*Malacothrix fendleri.*
*Opuntia microcarpa.*
*Orobanche multiflora.*
*Petalostemon gracile oligophyllum.*
*Phaca picta.*
*Quercus emoryi.*
*Quercus gambelii.*
*Simsia scaposa.*

**Roswell.** Altitude, 1,065 meters. **J8.**

The county seat of Chavez County, just west of the Pecos River. Mr. F. S. Earle, Prof. E. O. Wooton, and Dr. David Griffiths have collected here at various times.

*Adiantum modestum.*
*Nyctaginia cockerellae.*
*Rumex ellipticus.*

**Round Mountain.** **G9.**

A low peak on the line between the White and Sacramento mountains, in Otero County, along Tularosa Creek about halfway from Tularosa to the Mescalero Agency. Prof. E. O. Wooton has visited the place several times.

*Gutierrezia filifolia.*
*Mentzelia perennis.*

**Rowe.** Altitude, 2,045 meters. **H4.**

A station on the Santa Fe Railroad in the extreme western part of San Miguel County, near the Pecos River; visited by Prof. T. D. A. Cockerell.

*Castilleja integra intermedia.*

**Ruidoso Crossing.** Altitude, 2,025 meters. **H8.**

This is the crossing of Ruidoso Creek at Ruidoso store and post-office in the White Mountains, Lincoln County, at the edge of the Mescalero Apache Reservation. Professor Wooton has collected in the immediate vicinity.

*Sambucus neomexicana.*

**Sacramento Mountains.** **G10.**

A rather extensive range in the eastern part of Otero County. Its highest peaks rise to almost 3,000 meters. All plants listed for Cloudcroft and Fresnal should be included here. Professor Wooton seems to be the only botanist who has collected in the range.

*Lathyrus oreophilus.*
*Opuntia dillei.*

**Sandia Mountains.** Altitude, 3,120 meters. **F5.**

A range about 12 miles east of Albuquerque in northeastern Bernalillo and southeastern Sandoval counties. Doctor Bigelow gathered a considerable number of plants here in 1853, Dr. C. L. Herrick botanized here in 1897 and 1898, and Miss Charlotte Ellis in the last few years has collected a few plants about Placitas.

*Achillea laxiflora.*
*Aster bigelovii.*
*Clematis bigelovii.*
*Gentiana bigelovii.*
*Opuntia cymochila montana.*
*Opuntia missouriensis trichophora.*
*Opuntia sphaerocarpa.*
*Pentstemon whippleanus.*
*Primula ellisiae.*
*Tetraneuris trinervata.*
*Vilfa tricholepis.*

**San Miguel.** Altitude, 1,800 meters. **H4.**

A very old Mexican settlement on the Rio Pecos in southwestern San Miguel County, visited by Fendler in 1847.

*Calliandra herbacea.*
*Hymenopappus flavescens.*

**Santa Antonita.**

I have not been able to locate this point definitely; I find no mention of it in Whipple's Report. It must have been near Albuquerque, for Bigelow reached that settlement on October 3 and remained there until November, and we find that the plants collected at Santa Antonita were collected in October.

*Actinella leptoclada.*
*Deweya acaulis.*
*Ligusticum scopulorum.*

**Santa Barbara.** Altitude, about 1,185 meters. **E10.**

A Mexican settlement on the Rio Grande about 25 miles north of Las Cruces, visited by Wright.

*Layia neomexicana.*

**Santa Fe.** Altitude, 2,105 meters. **G4.**

The capital of New Mexico, in Santa Fe County; one of the oldest towns in the United States. This is historically the most interesting locality in the Southwest from a botanical standpoint, for here was made the first extensive collection of plants in the whole southwestern region.

The first botanical collector to visit the place, and the first botanist to collect in New Mexico, was William Gambel, who passed through Santa Fe in 1841 or 1842 on his way to California. His collections were described by Thomas Nuttall. Doctor Wislizenus, on his way to Mexico, visited the place in 1846 and collected a few plants here. But it was not until 1847 that the ground was at all thoroughly worked over in this now historic locality. August Fendler came from St. Louis over the Santa Fe trail in the autumn of 1846 and arrived at Santa Fe about October 11. His arrival was too late to allow any collecting that season, but he began early in the spring of 1847.

This is one of the few localities in New Mexico of whose spring flora we have much knowledge. In most parts of the Territory the collecting has been done during the late summer months. Fendler remained in Santa Fe until August, gathering a large amount of material from which Doctor Gray in Plantae Fendlerianae described some of our commonest southwestern species. He left Santa Fe so early in the summer that he missed many plants he might have gotten later, for plant life in the mountains of the Southwest reaches its best only after the late summer rains, in August and September. Indeed, it is of little use to go into the mountains for collecting before the first of July.

In 1897 Prof. A. A. Heller made a large collection in this same region, with Santa Fe for his headquarters, collecting again many of Fendler's species. He was at Santa Fe only during the early part of the summer and, like Fendler, missed the season for best collecting. Mr. G. R. Vasey, Mr. S. M. Tracy, Prof. T. D. A. Cockerell, and Mrs. W. H. Bartlett are later botanists who have made small collections at Santa Fe. In 1908 the writer collected some of Fendler's plants in their original localities. No one, however, has ever collected at Santa Fe late in the season, and many new species could probably be added to the flora if collecting were done at this time.

Santa Fe stands on a sandy plain which stretches westward for about 20 miles to the Rio Grande. To the east rise the high peaks of the Santa Fe Mountains, 3,600 to 3,900 meters high. The low foothills, like the mesa, are a poor collecting ground, covered as they are with juniper, cedar, piñon, cactus, and low shrubs, with but a scanty mantle of herbaceous plants. But after one has gone 10 or 12 miles eastward into the mountains he finds a luxuriant vegetation. Santa Fe Creek, or River, as it is more commonly called, is a small stream which comes down from the mountains through Santa Fe Canyon and runs through the town, furnishing its water supply. It was along this stream and on the plains about Santa Fe that Fendler got most of his plants. He went as far west as the valley of the Rio Grande. Judging from the list given in Plantae Fendlerianae, perhaps on account of the hostility of the Indians in 1847, he did not venture more than 12 miles or so into the mountains, while if he had gone farther he would have found hundreds of plants not in his collection. Fifteen or 20 miles away he would have found a subalpine flora that would have been rich in plants then undescribed.

Those plants that have their type localities at Santa Fe or in the vicinity, the most of them first collected by Fendler, are as follows:

*Abronia fendleri.*
*Actinella argentea.*
*Actinella richardsonii floribunda.*
*Allionia diffusa.*
*Amaranthus bracteosus.*
*Aplopappus spinulosus canescens.*
*Arabis gracilenta.*
*Arabis holboellii fendleri.*
*Aragallus pinetorum.*
*Archemora fendleri.*

*Argemone hispida.*
*Aristida fendleriana.*
*Aristida longiseta.*
*Astragalus cyaneus.*
*Astragalus diphysus.*
*Astragalus diphysus albiflorus.*
*Astragalus feensis.*
*Berberis fendleri.*
*Brickellia fendleri.*
*Bulbostylis annua.*
*Calycodon montanum.*
*Cardamine cordifolia.*
*Ceanothus fendleri.*
*Cheilanthes fendleri.*
*Chenopodium leptophyllum oblongifolium.*
*Cirsium ochrocentrum.*
*Corispermum hyssopifolium microcarpum.*
*Corydalis montana.*
*Crepis ambigua.*
*Cymopterus fendleri.*
*Dieteria gracilis.*
*Diplopappus ericoides hirtella.*
*Dodecatheon radicatum.*
*Draba aurea stylosa.*
*Draba helleriana.*
*Draba neomexicana.*
*Draba neomexicana robusta.*
*Drymaria sperguloides.*
*Echinocereus fendleri.*
*Epilobium fendleri.*
*Epilobium novomexicanum.*
*Erigeron canus.*
*Erigeron cinereus.*
*Erigeron flagellaris.*
*Erigeron pulcherrimus.*
*Erigeron wootonii.*
*Eriogonum lachnogynum.*
*Eriogonum microthecum fendlerianum.*
*Euphorbia fendleri.*
*Euphorbia montana gracilior.*
*Forestiera neomexicana*
*Fragaria bracteata.*
*Galium asperrimum.*
*Galium fendleri.*
*Geranium atropurpureum.*
*Hedeoma ciliata.*
*Heuchera flavescens.*
*Hieracium fendleri.*
*Holodiscus australis.*
*Hydrophyllum occidentale fendleri.*
*Krynitzkia fendleri.*
*Lepidium alyssoides.*
*Lesquerella alpina intermedia.*
*Linum australe.*
*Linum rigidum puberulum.*
*Lupinus decumbens argophyllus.*
*Lupinus helleri.*
*Macrorhynchus purpureus.*
*Mamillaria papyracantha.*
*Mentzelia parviflora.*
*Mertensia pratensis.*
*Monarda pectinata.*
*Nasturtium sphaerocarpum.*
*Notholaena fendleri.*
*Oenothera albicaulis runcinata.*
*Oenothera eximia.*
*Oenothera fendleri.*
*Oenothera pinnatifida integrifolia.*
*Opuntia phaeacantha.*
*Pedicularis fluviatilis.*
*Phaca fendleri.*
*Phaca gracilenta.*
*Phaca macrocarpa.*
*Philadelphus microphyllus.*
*Phlox nana.*
*Phoradendron juniperinum.*
*Physalis fendleri.*
*Physalis neomexicana.*
*Pleopogon setosum.*
*Polygonum longistylum.*
*Potentilla arachnoidea.*
*Potentilla crinita.*
*Potentilla diffusa.*
*Potentilla ovalis.*
*Potentilla propinqua.*
*Quercus undulata obtusifolia.*
*Quercus undulata pedunculata.*
*Rosa fendleri.*
*Rubus nutkanus parvifolius.*
*Sambucus melanocarpa.*
*Schkuhria neomexicana.*
*Sedum cockerellii.*
*Selaginella rupestris fendleri.*
*Senecio fendleri.*
*Senecio sanguisorboides.*
*Sidalcea candida.*
*Sidalcea neomexicana.*
*Sisymbrium incisum.*
*Sorbus scopulina.*
*Sphaeralcea fendleri.*
*Stipa scribneri.*
*Streptanthus linearifolius.*
*Streptanthus micranthus.*

*Thaspium montanum.*
*Thelesperma formosum*
*Thlaspi fendleri.*
*Townsendia eximia.*
*Townsendia fendleri.*
*Vesicaria fendleri.*
*Viola neomexicana*

**Santa Rita.** Altitude, 1,900 meters. **C9.**

A mining camp in Grant County about 15 miles east of Silver City. This is spoken of by various writers as Santa Rita, Santa Rita del Cobre, Cobre, and the Copper Mines. Santa Rita Mountain and Coppermine Creek are near by. The settlement is a very old one, the Spaniards having mined copper here for probably more than two hundred years. Bigelow, Thurber, and Wright collected here in the early fifties, the last extensively, and from their collections Doctor Gray described many common New Mexican plants. Lieutenant Emory visited Santa Rita in 1847 and gathered a few plants in the vicinity. But little collecting has been done at Santa Rita since Wright's time. Dr. E. L. Greene collected here in 1880 and 1881, and in 1904, Mr. O. B. Metcalfe secured a very few specimens in the vicinity. Considerable collecting has been done in the mountains surrounding the locality, but not at Santa Rita itself; and the place would well repay some time spent in making a large collection, in order to add authoritative material to Wright's often scanty types.

In the report of Emory's Reconnaissance, opposite page 59, there is a drawing showing Santa Rita as it appeared at that time.

*Acerates auriculata.*
*Adenophyllum wrightii.*
*Agave americana latifolia.*
*Amaranthus obovatus.*
*Amaranthus wrightii.*
*Amarella cobrensis.*
*Anoda wrightii.*
*Anogra neomexicana.*
*Arenaria saxosa.*
*Artemisia wrightii.*
*Asclepias nummularia.*
*Asclepias scaposa.*
*Asclepias wrightii.*
*Astragalus cobrensis.*
*Astragalus fallax.*
*Astragalus humistratus.*
*Bidens heterosperma.*
*Boerhaavia purpurascens.*
*Brickellia betonicaefolia.*
*Brickellia wrightii.*
*Calliandra reticulata.*
*Carex neomexicana.*
*Castilleja affinis minor.*
*Collomia thurberi.*
*Cologania longifolia.*
*Commelina linearis longispatha.*
*Conobea intermedia.*
*Dalea filiformis.*
*Dalea polygonoides.*
*Desmodium grahami.*
*Echeandia terniflora angustifolia.*
*Erigeron neomexicanus.*
*Erigeron platyphyllus.*
*Eriogonum densum.*
*Euphorbia bilobata.*
*Euphorbia dentata cuphosperma.*
*Euphorbia dioica indivisa.*
*Frasera venosa.*
*Heuchera rubescens nana.*
*Hosackia wrightii.*
*Ionoxalis grayi.*
*Juncus longistylis.*
*Lepidium thurberi.*
*Lithospermum cobrense.*
*Mamillaria wrightii.*
*Monnina wrightii.*
*Oenothera wrightii.*
*Onosmodium thurberi.*
*Oxybaphus coccineus.*
*Pellaea wrightiana.*
*Pentstemon virgatus.*
*Pericome caudata.*

*Perityle coronopifolia.*
*Phacelia neomexicana.*
*Phaseolus angustifolius tenuifolius.*
*Phaseolus macropoides.*
*Portulaca suffrutescens.*
*Potentilla thurberi.*
*Rubus neomexicanus.*
*Scrophularia coccinea.*
*Sida neomexicana.*
*Silene wrightii.*
*Stevia macella.*
*Symphoricarpos rotundifolius.*
*Thaspium montanum tenuifolium.*
*Verbena canescens neomexicana.*

**Sapello Canyon.** **H3.**

The valley of the Rio Sapello or Sapello Creek which rises in the Las Vegas Range in northwestern San Miguel County and flows eastward into the Mora River. Prof. T. D. A. Cockerell has collected in the vicinity at various times.

*Cypripedium veganum.*

**Sierra Blanca.** Altitude, 3,565 meters. **G8.**

White Mountain Peak. The highest mountain in southern New Mexico, in the White Mountains, in the extreme northern part of Otero County. It is one of the best places in New Mexico for botanical collecting. The term is also, and more properly, used of the White Mountain Range as a whole, but infrequently by the English-speaking population. Professor Wooton has visited the peak several times.

*Rhodiola neomexicana.*

**Silver City.** Altitude, 1,765 meters. **C9.**

The principal town of Grant County, on a branch of the Santa Fe Railroad, in the northeastern part of the county. Dr. E. L. Greene, Dr. H. H. Rusby, Professor Wooton, and Mr. O. B. Metcalfe have collected here.

*Amaranthus graecizans pubescens.*
*Asclepias uncialis.*
*Cyperus rusbyi.*
*Gutierrezia tenuis.*
*Lotus neomexicanus.*
*Lupinus neomexicanus.*
*Ptelea subvestita.*

**Socorro.** Altitude, 1,375 meters. **E7.**

The county seat of Socorro, New Mexico's largest county, in the eastern part of the county, on the Santa Fe Railroad, near the Rio Grande. The collectors here have been Wislizenus, Lieutenant Emory, and G. R. Vasey.

*Poa arida.*

**Sulphur Springs.**

There are springs of this name and a post-office by the name of Sulphur in northeastern Sandoval County, but it is doubtful whether this is the locality referred to in the present paper. *Astragalus crescenticarpus* was collected by Mr. G. R. Vasey at a place of this name.

**Tortugas Mountain.** **F10.**

A low, rounded, limestone mountain standing on the mesa about 3 miles east of the Agricultural College, Dona Ana County. It is a most interesting place botanically, because its flora is quite different from that of the surrounding mesa and from that of the main part of the Organ Mountains. Professor Wooton and others connected with the Agricultural College have collected here frequently.

*Linum vernale.*

**Truchas Peaks.** Altitude, 3,982 meters. **H3.**

A group containing the highest peaks in New Mexico, in the Pecos River National Forest, on the line between Mora and Rio Arriba counties. They are the only mountains in the Territory upon which snow usually remains all summer. Professor and Mrs. T. D. A. Cockerell visited the locality in 1902 and the writer collected there in August, 1908. These peaks are one of the most interesting collecting grounds in New Mexico, and are reached without great difficulty by going up the Pecos River from the village of Pecos.

*Mertensia caelestina.*

**Tucumcari Hills.** **L5.**

A low range of hills in Quay County just east of the present town of Tucumcari, visited by Bigelow in 1853.

*Opuntia davisii.*

**Tularosa Creek.** **G9.**

There are two streams of this name in New Mexico, one in the northern part of the Gila National Forest in Socorro County flowing into the Frisco, and the other, the one referred to in this paper, in northeastern Otero County, rising between the White and Sacramento ranges and flowing down past the Mescalero Agency and the town of Tularosa out upon the plains where it disappears. Professor Wooton has collected along the stream.

*Gaura neomexicana.* *Lesquerella aurea.*

**Valverde.** **E8.**

Wislizenus, who collected here, speaks of this as "the mud walls of a deserted Mexican village" on the east bank of the Rio Grande about 30 miles below Socorro.

*Dithyraea wislizeni.*

**White Mountains.** **G8.**

An extensive range, the highest in southern New Mexico and the highest to be found anywhere in the Territory outside the Pecos River National Forest, lying in the southern part of Lincoln and the north-

eastern part of Otero counties. Prof. E. O. Wooton made a large collection in this range in the summer of 1897, visiting many parts of it. He has collected here in other years both before and since.

*Agoseris graminifolia.*
*Allionia pinetorum.*
*Amaranthus viscidulus.*
*Amarella revoluta.*
*Arenaria confusa.*
*Aster hesperius wootonii.*
*Berberis haematocarpa.*
*Brittonastrum neomexicanum.*
*Carduus perennans.*
*Castilleja wootonii.*
*Chrysothamnus confinis.*
*Coleosanthus ambigens.*
*Draba patens.*
*Erigeron formosissimus.*
*Eriocarpum serratum.*
*Eriocarpum wootonii.*
*Eriogonum jamesii neomexicanum.*
*Gaura neomexicana.*
*Grindelia scabra.*
*Gutierrezia filifolia.*
*Gutierrezia longifolia.*
*Heuchera wootonii.*
*Laciniaria lancifolia.*
*Lepidium eastwoodiae.*
*Lesquerella aurea.*
*Mentzelia perennis.*
*Monarda stricta.*
*Philadelphus argyrocalyx.*
*Potentilla sierraeblancae.*
*Ptelea formosa.*
*Ptelea parvula.*
*Rhamnus fasciculata.*
*Rhodiola neomexicana.*
*Sambucus neomexicana.*
*Scrophularia montana.*
*Senecio canovirens.*
*Senecio wootonii.*
*Tetradymia filifolia.*
*Tetraneuris angustifolia.*
*Verbena perennis.*

**White Sands.** **G9.**

A large area covered with dunes of pure white gypsum sand, in the western part of Otero County, 15 or 20 miles west of Alamogordo. Mr. Frederick V. Coville, Dr. D. T. MacDougal, Prof. E. O. Wooton, Prof. T. D. A. Cockerell, and the writer have collected here. The place is one of great interest for the botanist. Little grows upon the dunes, but in depressions among them vegetation is more abundant, and about the edge of the area there is a good growth of shrubbery and herbaceous plants, some of them ones which have been found nowhere else.

*Abronia angustifolia.*
*Andropogon neomexicanus.*
*Bigelovia graveolens appendiculata.*
*Conanthus carnosus.*
*Oenothera albicaulis gypsophila.*
*Oenothera tubicula filifolia.*
*Selinocarpus lanceolatus.*
*Sporobolus giganteus.*
*Wootonia parviflora.*

**Winsors Ranch.** Altitude, 2,520 meters. **H3.**

In San Miguel County, on the Pecos River, about 20 miles above the town of Pecos and about 3 miles above the mouth of the Mora River. The writer collected about eight hundred numbers in the vicinity in the summer of 1908. Messrs. Maltby and Coghill, of the University of New Mexico, collected here in 1897, and Mrs. W. H. Bartlett has sent to the Agricultural College several hundred plants gathered by herself in this same region.

*Castilleja inconstans.*
*Erigeron pecosensis.*

**Wolf Creek.** **I3.**

A small stream flowing into the Mora River in the southern part of Mora County. Wislizenus crossed it in 1846.

*Echinocereus triglochidiatus.*
*Echinocereus viridiflorus.*
*Geranium pentagynum.*

**Zuni.** **A5.**

One of the best known and the largest of the New Mexican pueblos now inhabited, in the extreme southwestern corner of McKinley County. Doctors Woodhouse and Bigelow both collected here. Professor Wooton has visited the region two or three times. The Zuni River flows past the pueblo, and the Zuni Mountains are near by.

*Aster woodhousei.*
*Cereus hexaedrus.*
*Eriogonum alatum.*
*Eriogonum effusum leptophyllum.*
*Eriogonum orthocladon.*
*Juniperus pachyphloea.*
*Monarda punctata humilis.*
*Opuntia stenochila.*
*Opuntia whipplei.*
*Stachys rothrockii.*
*Tetraneuris ivesiana.*
*Tripterocalyx wootonii.*

## SPECIES DESCRIBED FROM UNKNOWN POINTS IN NEW MEXICO.

The following plants have their type localities in New Mexico, but they can not be referred to any definite part of the Territory:

*Acalypha neomexicana.*
*Antennaria marginata.*
*Aristida subuniflora.*
*Aster ericaefolius tenuis.*
*Astragalus rothrockii.*
*Bigelovia graveolens latisquamea.*
*Brickellia rusbyi.*
*Carpochaete bigelovii.*
*Cedronella cana lanceolata.*
*Dalea wislizeni sessilis.*
*Drymaria fendleri.*
*Eritrichium glomeratum hispidissimum.*
*Galium acutissimum.*
*Galium brandegei.*
*Gilia rigidula acerosa.*
*Hedeoma piperita oblongifolia.*
*Heuchera novomexicana.*
*Heuchera sitgreavesii.*
*Hymenopappus robustus.*
*Juglans rupestris.*
*Lathyrus palustris graminifolius.*
*Leucelene ericoides serotina.*
*Mamillaria vivipara radiosa borealis.*
*Mamillaria vivipara radiosa neomexicana.*
*Margaranthus purpurascens.*
*Muhlenbergia acuminata.*
*Muhlenbergia neomexicana.*
*Opuntia arborescens.*
*Opuntia hystricina.*
*Phacelia caerulea.*
*Poa bigelovii.*
*Schmaltzia emoryi.*
*Senecio neomexicanus.*
*Sphaeralcea emoryi.*
*Sphaeralcea incana.*
*Thalictrum fendleri polycarpum.*
*Tragia stylaris.*
*Uropappus pruinosus.*
*Vicia leucophaea.*
*Wedelia incarnata anodonta.*

## EXPLANATION OF THE MAPS.

The two maps of the Territory of New Mexico used here are for the most part self-explanatory. The colored folded map is based upon one recently published in the Annual Report of the Governor of New Mexico. There have been added to it a few stations not appearing

upon the original. In addition, all the localities from which new plants have been described are conspicuously marked—towns, peaks, etc., with red dots, and streams and mountain ranges with red lines directly underneath their names. Several places mentioned in the list of species will not be found upon the map, because it has been impossible to locate them definitely enough for insertion. The letters and numbers following each name in the list of localities will enable one to locate readily any of the type stations upon the map.

The relief map which appears as plate 21 was originally published in Bulletin 66 of the New Mexico Agricultural Experiment Station. It has also been used in Bulletin 215 of the Office of Experiment Stations, U. S. Department of Agriculture. It is reproduced here because it shows much better than the other the relief features of the Territory which are important not only for the study of the plant geography of New Mexico but for the location of certain type localities as well.

## SYSTEMATIC LIST OF PLANTS.

### POLYPODIACEAE.

**Adiantum modestum** Underw. Bull. Torrey Club **28:** 46. 1901.

"Roswell. Abundant on rocks and grassy points overhanging the water of North Spring River," August 3, 1900, *F. S. Earle* 261.

**Cheilanthes fendleri** Hook. Sp. Fil. **2:** 103. 1858.

"New Mexico," *Fendler* 1015 in 1847.

Collected somewhere about Santa Fe. This fern is not uncommon in this region; about rocks in rather dry places.

**Notholaena fendleri** Kunze, Farnkr. **2:** 87. *pl. 136.* 1851.

"In Neu-Mexico, ohne näheren Fund- und Standort," *Fendler* 1017a in 1847.

Very rare in northern New Mexico, apparently.

**Pellaea wrightiana** Hook. Sp. Fil. **2:** 142. 1858.

"New Mexico," *Wright* 2130 in 1851.

This number of Wright's according to information kindly furnished by the Gray Herbarium, was collected on "mountains around the Cobre. On rocky ledges, October 20."

### SELAGINELLACEAE.

**Selaginella rupestris fendleri** Underw. Bull. Torrey Club **25:** 127. 1898.

New Mexico, *Fendler* 1024 in 1847.

**Selaginella rupincola** Underw. Bull. Torrey Club **25:** 129. 1898.

"On perpendicular rocks, Organ Mountains," July 10, 1897, *E. O. Wooton.*

Very abundant in this locality, along with several other members of the genus.

### PINACEAE.

**Pinus brachyptera** Engelm. in Wisliz. Mem. North. Mex. 89. 1848.

=*Pinus scopulorum* (Engelm.) Lemmon.

"Mountains of New Mexico," Wislizenus in 1846.

**Pinus edulis** Engelm. in Wisliz. Mem. North. Mex. 88. 1848.

"From the Cimarron to Santa Fe," *Wislizenus* in 1846.

In his journal for June 22 Doctor Wislizenus says: "On Ocaté Creek there are some pines, the first we have seen close to the road." These may have been *P. brachyptera*, but were probably *P. edulis*, for the latter occurs at lower levels and would be the the first pine met with in most places. At any rate the tree was not found farther to the north and east than this, and may have been collected around Santa Fe, where it is exceedingly abundant on the lower hills.

**Pinus engelmanni** Torr. Pac. R. Rep. **4:** 141. 1856.

Proposed as a new name for *P. brachyptera* because Doctor Torrey considered the latter name inappropriate.

## JUNIPERACEAE.

**Juniperus megalocarpa** Sudworth, Forestry & Irrigation **13:** 307. 1907.

"Approximately in section 11 or 14, township 9 south, range 20 west, of the Gila National Forest, N. Mex. The location is midway between the towns of Alma and Frisco, and about three miles above the 'Widow Kelley's Ranch,' on the San Francisco River." Collected by W. R. Mattoon, September 22, 1906.

**Juniperus pachyphloea** Torr. Pac. R. Rep. **4:** 142. 1856.

"On the Zuni Mountains," *Dr. S. W. Woodhouse* in 1852.

## EPHEDRACEAE.

**Ephedra trifurca** Torr. in Emory, Mil. Recon. 152. 1848.

"Between the Del Norte and the Gila," *Emory* in 1847.

## POACEAE.

**Andropogon neomexicanus** Nash, Bull. Torrey Club **25:** 83. 1898.

"On the White Sands," August 26, 1897, *E. O. Wooton.*

**Aristida fendleriana** Steud. Syn. Pl. Glum. **1:** 420. 1855.

"New Mexico," *Fendler* 973 in 1847.

**Aristida longiseta** Steud. Syn. Pl. Glum. **1:** 420. 1855.

"New Mexico," *Fendler* 978 in 1847.

One of the most abundant of the grasses about Santa Fe, on the mesas and in the foothills.

**Aristida subuniflora** Nash in Small, Fl. Southeast. U. S. 116. 1903.

"New Mexico," *G. R. Vasey.*

**Bouteloua pusilla** Vasey; Scribn. Bull. Torrey Club **11:** 6. 1884.

=*Bouteloua prostrata* Lag.

"New Mexico," *G. R. Vasey.*

According to the label this was collected at "Kingman, New Mexico." So far as I know there is no town of this name in New Mexico, but there is one in Arizona, and the grass was collected in that Territory probably.

**Bromus porteri frondosus** Shear, U. S. Dept. Agr. Div. Agrost. Bull. **23:** 37. 1900.

"Mangas," *J. G. Smith.*

**Calycodon montanum** Nutt. Journ. Acad. Phila. n. ser. **1:** 186. 1848.

= *Muhlenbergia gracilis* Trin.

"In the Rocky Mountains near Santa Fe," *William Gambel.*

**Chaetochloa grisebachii ampla** Scribn. & Merrill, U. S. Dept. Agr. Div. Agrost. Bull. **21:** 36. 1900.
"Organ Mountains," *G. R. Vasey* in 1881.

**Chondrosium eriopodum** Torr. in Emory, Mil. Recon. 154. 1848.
=*Bouteloua eriopoda* Torr.
"Along the Del Norte," *Emory* in 1847.

**Chondrosium foeneum** Torr. in Emory, Mil. Recon. 154. *pl. 12.* 1848.
=*Bouteloua hirsuta* Lag.
"Uplands bordering the valley of the Del Norte," *Emory* in 1847.

**Eragrostis fendleriana** Steud. Syn. Pl. Glum. **1:** 278. 1855.
=*Poa fendleriana* (Steud.) Vasey.
"Mexico," *Fendler* 932 in 1847.
Steudel was mistaken in giving the locality as Mexico, for it should undoubtedly be New Mexico.

**Muhlenbergia acuminata** Vasey, Bot. Gaz. **11:** 337. 1886.
"New Mexico?," *Wright* 1993.
Miss Mary A. Day, of the Gray Herbarium, has attempted to locate the type locality of this plant from Wright's field notes, but since the label does not bear the collection number (as some of Wright's specimens in the Gray Herbarium do) it is impossible to tell just where the type was collected. There is some evidence which indicates that it may have come from Santa Rita, but it is impossible to be certain.

**Muhlenbergia neomexicana** Vasey, Bot. Gaz. **11:** 337. 1886.
"Rocky hills and mountain sides, New Mexico."

**Panicum lachnanthum** Torr. Pac. R. Rep. **3:** 20. 1857.
=*Valota saccharata* (Buckl.) Chase.
"On the Burro Mountains," *Dr. Thomas Antisell* in August, 1854.

**Pleopogon setosum** Nutt. Journ. Acad. Phila. n. ser. **1:** 189. 1848.
=*Lycurus phleoides* H. B. K.
"Mountains of Santa Fe," *William Gambel.*

**Poa arida** Vasey, Contr. Nat. Herb. **1:** 270. 1893.
"Socorro," *G. R. Vasey* in 1881.

**Poa bigelovii** Vasey & Scribn. Contr. Nat. Herb. **1:** 270. 1893.
"New Mexico," *Fendler* 931 in 1847.
Probably collected along Santa Fe Creek east of Santa Fe.

**Poa tracyi** Vasey, Contr. Nat. Herb. **1:** 276. 1893.
"On mountain sides at Raton," *S. M. Tracy.*

**Sitanion caespitosum** J. G. Smith, U. S. Dept. Agr. Div. Agrost. Bull. **18:** 16. 1899.
"Near Cliff," *J. G. Smith.*

**Sporobolus giganteus** Nash, Bull. Torrey Club **25:** 88. 1898.
"On the White Sands," August 26, 1907, *E. O. Wooton* 394.

**Stipa scribneri** Vasey, Bull. Torrey Club **11:** 125. 1884.
"On dry hillsides at Santa Fe."

**Tricuspis mutica** Torr. Pac. R. Rep. **4:** 156. 1856.
=*Triodia mutica* (Torr.) Scribn.
"Laguna Colorado," September, 1853, *Bigelow.*

**Vilfa tricholepis** Torr. Pac. R. Rep. **4:** 155. 1856
*Blepharoneuron tricholepis* (Torr.) Nash.
"Sandia Mountains," October, 1853, *Bigelow.*

## CYPERACEAE.

**Carex agrostoides** Mackenzie, Bull. Torrey Club **34:** 607. 1907.

"Luna, northwest of Mogollon Mountains, Socorro County," July 28, 1900, *E. O. Wooton*, altitude, 1,950 meters.

**Carex neomexicana** Mackenzie, Bull. Torrey Club **34:** 607. 1907.

"Santa Rita del Cobra, on the Rio Mimbras," *Bigelow*, 1547.

For Cobra read Cobre, and for Mimbras, Mimbres.

**Cyperus rusbyi** Britton, Bull. Torrey Club **11:** 29. 1884.

"Near Silver City," *H. H. Rusby.*

**Fuirena cylindrica** Bush, Rep. Mo. Bot. Gard. **16:** 91. 1904.

"In the valley of the Rio Grande, below Dona Ana," Mexican Boundary Survey.

It is possible that this locality is incorrect, for no such plant has been found anywhere in this vicinity in late years. The description of the locality was taken from the heading of the label, evidently, and, as is explained elsewhere, no reliance can be placed upon it.

## COMMELINACEAE.

**Commelina crispa** Wooton, Bull. Torrey Club **25:** 451. 1898.

"At the base of the Organ Mountains," September 1, 1897, *E. O. Wooton* **545,** altitude 1,450 meters.

Growing in the foothills of the Organs, and down across the mesa to the west, especially under low shrubs which line the edges of the arroyos.

**Commelina linearis longispatha** Torr. Bot. Mex. Bound. 224. 1859.

"Near the Copper Mines," August, *Bigelow* (also collected by Wright and Fendler).

**Tradescantia tuberosa** Greene, Bot. Gaz. **6:** 185. 1881.

"Pinos Altos Mountains," August 23, 1880, *E. L. Greene.*

## JUNCACEAE.

**Juncus arizonicus** Wiegand, Bull. Torrey Club **27:** 517. 1900.

"Copper Mines," *Geo. Thurber.*

Just why the specific name *arizonicus* should have been applied to this New Mexican plant is difficult to explain.

**Juncus brachyphyllus** Wiegand, Bull. Torrey Club **27:** 519. 1900.

For a discussion of the probable type locality of this plant see Rhodora **11:** 156. 1909.

**Juncus longistylis** Torr. Bot. Mex. Bound. 223. 1859.

"Near the Copper Mines," June, *Bigelow, Wright* 1924 in 1851.

## MELANTHIACEAE.

**Zygadenus porrifolius** Greene, Bull. Torrey Club **8:** 123. 1881.

"Mogollon Mountains, near the summits," *E. L. Greene* in 1881.

## LILIACEAE.

**Allium arenicola** Osterhout, Bull. Torrey Club **27:** 506. 1900.

=*Allium sabulicola* Osterhout.

"In sandy soil on the bank of the Chama River at Chama," June 9, 1899, *Geo. E. Osterhout* 2008.

**Allium neomexicanum** Rydb. Bull. Torrey Club **26:** 541. 1899.

"Organ Mountains," *E. O. Wooton* in 1894.

**Allium sabulicola** Osterhout, Bull. Torrey Club **27:** 539. 1900.
A new name for *A. arenicola.*

**Brodiaea capitata** var.? **pauciflora** Torr. Bot. Mex. Bound. 218. 1859.
=*Dichelostemma pauciflorum* (Torr.).
"Near the Copper Mines," *Bigelow* (other collectors and localities mentioned).

**Calochortus gunnisonii perpulcher** Cockerell, Bot. Gaz. **29:** 281. 1900.
"Harvey's Ranch near Las Vegas," *T. D. A. Cockerell.*

**Echeandia terniflora** var.? **angustifolia** Torr. Bot. Mex. Bound. 219. 1859.
"Copper Mines," *Bigelow, Wright* (other localities mentioned).

## AMARYLLIDACEAE.

**Agave americana** var.? **latifolia** Torr. Bot. Mex. Bound. 213. 1859.
"Hills near the Copper Mines," *Emory,* and other collectors.

## ORCHIDACEAE.

**Corallorhiza grabhami** Cockerell, Torreya **3:** 139. 1903.
In the immediate vicinity of Pecos, June 17, 18, 1903, *Dr. M. Grabham.*

**Cypripedium veganum** Cockerell, Proc. Biol. Soc. Washington **14:** 178. 1901.
"Sapello Canyon, Las Vegas Range," at 2,400 meters, in June, *T. D. A. Cockerell.*
A beautiful and abundant plant, common not only in the Las Vegas Range but in the Santa Fe Mountains as well. The plants often form large masses, several feet across.

**Habenaria brevifolia** Greene, Bot. Gaz. **6:** 218. 1881.
"Dry southward slopes of the Pinos Altos Mountains, New Mexico, in open woods of *Pinus ponderosa,*" September 14, 1880, *E. L. Greene.*
Of rare and sparing occurrence in some of the other ranges of southern New Mexico.

## JUGLANDACEAE.

**Juglans rupestris** Engelm. in Sitgreaves, Rep. Zuni & Colo. 171. 1854.
"New Mexico," *Dr. Woodhouse* in 1852.
This may have come from Arizona, for New Mexico, in the sense used in the work cited, comprised most if not all of that Territory.

**Juglans rupestris** var.? **major** Engelm. in Sitgreaves, Rep. Zuni & Colo. 171. 1854.
"Western New Mexico," *Dr. Woodhouse* in 1852; "at the Copper Mines," *Bigelow.*
"Western New Mexico" is certainly Arizona.

## BETULACEAE.

**Alnus oblongifolia** Torr. Bot. Mex. Bound. 204. 1859.
"Banks of the Mimbres and near Santa Barbara," *Wright* 1864 in 1851.

## FAGACEAE.

**Quercus douglassii novomexicana** A. DC. Prodr. **16**$^2$: 24. 1864.
=*Quercus novomexicana* (A. DC.) Rydb.
"In Novo Mexico ad Santa Fe," *Fendler* 809, 810, and 810b, in 1847.

**Quercus emoryi** Torr. in Emory, Mil. Recon. 151. *pl. 9.* 1848.
"In the elevated country between the Del Norte and the Gila," *Emory* in 1847.

**Quercus fendleri** Liebm. Overs. Dansk. Vid. Selsk. Forh. **1854:** 170. 1854.
"Plantae Nov. Mex. Fendleri n. *805, 807.*"
Collected somewhere near Santa Fe, no doubt.

**Quercus gambelii** Nutt. Journ. Acad. Phila. n. ser. **1:** 179. 1848.
"On the banks of the Rio del Norte, but not abundant," *William Gambel.*

**Quercus oblongifolia** Torr. in Sitgreaves, Rep. Zuni & Colo. 173. 1854.
"Western New Mexico," *Dr. Woodhouse* in 1852.
This was doubtless in Arizona.

**Quercus rydbergiana** Cockerell, Torreya **3:** 7. 1903.
"Common at Las Vegas Hot Springs," *T. D. A. Cockerell,* at 2,100 meters.

**Quercus undulata obtusifolia** A. DC. Prodr. **16**$^2$ **:** 23. 1864.
"In Novo Mexico," *Fendler* 807 in 1847.

**Quercus undulata pedunculata** A. DC. Prodr. **16**$^2$ **:** 23. 1864.
"In montibus Novi-Mexici prope Santa Fe," *Fendler* 808 in 1847.

## URTICACEAE.

**Urtica gracilenta** Greene, Bull. Torrey Club **8:** 122. 1881.
"Mimbres Mountains," *E. L. Greene* in May, 1877.

## MORACEAE.

**Humulus lupulus neomexicanus** Nelson & Cockerell, Proc. Biol. Soc. Washington **16:** 45. 1903.
"Beulah (Canadian Zone)," August, 1902, *T. D. A. Cockerell.*

## LORANTHACEAE.

**Phoradendron juniperinum** Engelm. in A. Gray, Mem. Amer. Acad. II. **4:** 58. 1849.
"Parasitic on the two kinds of shrub cedar (Juniperus) which grow on the hills and elevated plains about Santa Fe, and on no other tree," 1847, *Fendler* 281.

## POLYGONACEAE.

**Eriogonum abertianum** Torr. in Emory, Mil. Recon. 151. 1848.
"Between the Del Norte and the Gila," *Emory* in 1847; "also found by Lieutenant Abert on the upper waters of the Arkansas."
The latter locality is in Colorado. The species is one of the most common ones in southern New Mexico, but I have seen no specimens from the northern part of the Territory.

**Eriogonum abertianum neomexicanum** Gandoger, Bull. Soc. Bot. Belg. **42:** 185. 1906.
"Organ Mountains," *E. O. Wooton* 427 in 1897.

**Eriogonum alatum** Torr. in Sitgreaves, Rep. Zuni & Colo. 168. *pl. 8.* 1854.
"On the Zuni River," September, 1852, *Dr. S. W. Woodhouse.*

**Eriogonum cyclosepalum** Greene, Muhlenbergia **6:** 1. 1910.
"Open plains and table lands in New Mexico."

**Eriogonum densum** Greene, Pittonia **3:** 17. 1896.
"Mountains of New Mexico, near Santa Rita del Cobre."

**Eriogonum effusum** var.? **nudicaule** Torr. Pac. R. Rep. **4:** 132. 1856.
=*Eriogonum nudicaule* (Torr.) Small.
"In pine and cedar woods, near Galisteo," *Bigelow* in 1853.

**Eriogonum effusum leptophyllum** Torr. in Sitgreaves, Rep. Zuni & Colo. 168. 1854.

"Rio Zuni," September, 1852, *Dr. S. W. Woodhouse.*

**Eriogonum jamesii neomexicanum** Gandoger, Bull. Soc. Bot. Belg. **42:** 190. 1906.

"White Mountains," *E. O. Wooton* 385 in 1897.

Collected near Blazers Mill just below the Mescalero Agency, August 6.

**Eriogonum lachnogynum** Torr.; Benth. in DC. Prodr. **14:** 8. 1856.

"In New Mexico," *Fendler* 765 in 1847, collected somewhere near Santa Fe, probably.

**Eriogonum lonchophyllum** Torr. & Gr. Proc. Amer. Acad. **8:** 173. 1870.

"On the Rio Blanco, interior of New Mexico?," *Newberry* in Macomb's expedition.

**Eriogonum microthecum fendlerianum** Torr. & Gr. Proc. Amer. Acad. **8:** 171. 1870.

"New Mexico," *Fendler* 767 in 1847.

Collected either about Santa Fe or in northeastern New Mexico.

**Eriogonum orthocladon** Torr. in Sitgreaves, Rep. Zuni & Colo. 167. *pl. 9.* 1854.

"On the Zuni and San Francisco Mountains," *Dr. S. W. Woodhouse,* August and October, 1852.

The San Francisco Mountains, of course, are in Arizona.

**Eriogonum pinetorum** Greene, Muhlenbergia **6:** 3. 1910.

"Black Range, Sierra County," 1904, *O. B. Metcalfe* 1327.

**Eriogonum polycladon crispum** Gandoger, Bull. Soc. Bot. Belg. **42:** 196. 1906.

"Organ Mountains," *E. O. Wooton* 460 in 1897.

**Polygonum longistylum** Small, Bull. Torrey Club **21:** 169. 1894.

"New Mexico," *Fendler* 749 in 1847.

Doubtless collected somewhere near Santa Fe.

**Rumex ellipticus** Greene, Pittonia **4:** 234. 1900.

"In fields and along river banks at Roswell," August 5, 1900, *F. S. Earle.*

## CHENOPODIACEAE.

**Atriplex expansa** S. Wats. Proc. Amer. Acad. **9:** 116. 1874.

"Sandy saline places on the Del Norte."

**Chenopodium leptophyllum oblongifolium** S. Wats. Proc. Amer. Acad. **9:** 95. 1874.

"New Mexico," *Fendler* 717 in 1847.

In the region about Santa Fe.

**Corispermum hyssopifolium microcarpum** S. Wats. Proc. Amer. Acad. **9:** 123. 1874.

"New Mexico," *Fendler* 711 in 1847.

**Corispermum marginale** Rydb. Bull. Torrey Club **31:** 247. 1903.

"Albuquerque," *C. L. Herrick.*

**Obione acanthocarpa** Torr. Bot. Mex. Bound. 183. 1859.

=*Atriplex acanthocarpa* (Torr.) S. Wats.

"Plains between the Burro Mountains," September, *Bigelow;* and by other collectors in various places.

**Teloxys cornuta** Torr. Pac. R. Rep. **4:** 129. 1856.
=*Chenopodium cornutum* (Torr.) Benth. & Hook.
"Rocky Places, Hurrah Creek," *Bigelow* in 1853.
One of the commonest of southwestern plants, in the foothills of the mountains and up to altitudes of about 2,400 meters.

## AMARANTHACEAE.

**Amaranthus bracteosus** Uline & Bray, Bot. Gaz. **19:** 314. 1894.
"New Mexico," *Fendler* 735 in 1847.
Of the Santa Fe region.

**Amaranthus graecizans pubescens** Uline & Bray, Bot. Gaz. **19:** 317. 1894.
"Silver City," *E. L. Greene* 185.

**Amaranthus obovatus** S. Wats. Proc. Amer. Acad. **12:** 275. 1877.
"At the Copper Mines," October, 1851, *Wright* 1748 in part.

**Amaranthus viscidulus** Greene, Pittonia **3:** 344. 1898.
"In the Sierra Blanca," *E. O. Wooton* in 1897.
This was collected at Gilmores Ranch on Eagle Creek in the White Mountains. It is common there, growing on banks along the creek. It has been found in other parts of the Territory as well.

**Amaranthus wrightii** S. Wats. Proc. Amer. Acad. **12:** 275. 1876.
"At the Copper Mines," October, 1851, *Wright* 1748 in part.

**Gomphrena caespitosa** Torr. Bot. Mex. Bound. 181. 1859.
"Gravelly plains near the Organ Mountains; also at the Copper Mines and near Mimbres," April and May, *Bigelow, Wright* 1572 (other localities mentioned).
Rather rare in the foothills of the Organs and on the surrounding plains, flowering in early spring. The plants are almost always very small, as a result of the dryness of the season at which they flower.

## ALLIONIACEAE.

**Abronia angustifolia** Greene, Pittonia **4:** 344. 1898.
"White Sands of Dona Ana County," *E. O. Wooton* 157 in 1897.
One of the characteristic plants of the Sands, growing about their edge and even upon the dunes.

**Abronia bigelovii** Heimerl, Smiths. Misc. Coll. **53:** 197. 1908.
"Near Galisteo," *Bigelow* in October, 1853.
This plant has never been collected except this once, and then not in quantity.

**Abronia carnea** Greene, Pittonia **3:** 343. 1898.
=*Tripterocalyx cyclopterus* (A. Gray) Standley.
"At Las Cruces," *E. O. Wooton* 59 in 1897.

**Abronia fendleri** Standley, Contr. Nat. Herb. **12:** 324. *pl. 43.* 1909.
"At Santa Fe, New Mexico, May 19, 1847, *Fendler* 739, growing in 'moist places near fields, etc.'"
Not uncommon about Santa Fe, not only in moist places, but upon the drier mesas and hillsides.

**Abronia torreyi** Standley, Contr. Nat. Herb. **12:** 319. *pl. 38.* 1909.
"Mesilla, Dona Ana County, June 15, 1897," *E. O. Wooton* 11.
Very abundant upon the sandhills of the Mesilla Valley, not found upon the adobe soil.

**Abronia turbinata stenophylla** Heimerl, Ann. Cons. Jard. Genève **5:** 190. 1901.

The type of this is the same as that of *A. angustifolia* Greene, hence it is a synonym of that species.

**Allionia diffusa** Heller, Minn. Bot. Stud. **2:** 33. 1898.

"On dry gravelly hills, 10 miles west of Santa Fe," in 1897, *A. A. Heller* 3740.

**Allionia gracillima filifolia** Standley, Contr. Nat. Herb. **12:** 340. 1909.

"Mangas Springs," August 17, 1902, *E. O. Wooton.*

**Allionia pinetorum** Standley, Contr. Nat. Herb. **12:** 344. 1909.

"At Gilmore's ranch, on Eagle Creek, White Mountains, New Mexico, August, 1907, *Wooton & Standley* 3896, growing on a rather dry hillside with a southern exposure, under pine trees."

**Boerhaavia organensis** Standley, Contr. Nat. Herb. **12:** 385. 1909.

"In Filmore Canyon, Organ Mountains," October 23, 1904, *E. O. Wooton.*

Known only from the type locality.

**Boerhaavia purpurascens** A. Gray, Amer. Journ. Sci. II. **15:** 321. 1853.

"Stony hills near the copper mines of Santa Rita," *Wright* 1725 in 1851.

**Boerhaavia viscosa oligadena** Heimerl, Ann. Cons. Jard. Genève **5:** 189. 1901.

"Organ Mountains," 1897, *E. O. Wooton,* 421.

This widely diffused subspecies is common in the dry foothills of the Organ Mountains, extending down across the surrounding mesa, and even rarely into the valley of the Rio Grande.

**Mirabilis linearis subhispida** Heimerl, Ann. Cons. Jard. Genève **5:** 186. 1901.

=*Allionia linearis subhispida* (Heimerl) Standley.

"El Capitan Mountains," 1900, *F. S. Earle* 383.

**Mirabilis oxybaphoides glabrata** Heimerl, Ann. Cons. Jard. Genève **5:** 180. 1901.

=*Allioniella oxybaphoides glabrata* (Heimerl) Standley.

"El Capitan Mountains," 1900, *F. S. Earle* 399.

**Nyctaginia cockerellae** A. Nelson, Proc. Biol. Soc. Washington **16:** 29. 1903.

"Near Roswell," *Mrs. Wilmatte P. Cockerell.*

**Oxybaphus coccineus** Torr. Bot. Mex. Bound. 169. 1859.

=*Allionia coccinea* (Torr.) Standley.

"Hillsides, copper mines, and on the Mimbres," *Wright* 1723 in 1851. (Other collectors and localities mentioned.)

**Selinocarpus lanceolatus** Wooton, Bull. Torrey Club **25:** 304. 1898.

"On white soil (mostly gypsum?) just south of the White Sands," August 26, 1897, *E. O. Wooton* 389, altitude, 1,220 meters.

An interesting plant of rather limited distribution, growing along the edge of the sands, but not on the dunes.

**Tripterocalyx wootonii** Standley, Contr. Nat. Herb. **12:** 329. 1909.

"Near Ojo Caliente, Zuni Reservation," July 20, 1906, *E. O. Wooton;* and "on the Zuni Reservation," in 1904, *E. O. Wooton* 2820.

**Wedelia incarnata anodonta** Standley, Contr. Nat. Herb. **12:** 333. 1909.

=*Wedeliella incarnata anodonta* (Standley) Cockerell.

"Plains of western New Mexico," July, 1880, *H. H. Rusby* 355.

## PORTULACACEAE.

**Portulaca suffrutescens** Engelm. Bot. Gaz. **6:** 236. 1881.

"In western New Mexico at the copper mines," *Wright* 874 in 1851. (Other localities and collectors mentioned.)

**Talinum brachypodum** S. Wats. Proc. Amer. Acad. **20:** 355. 1885.

"Near the Indian village Laguna," *Mr. & Mrs. J. G. Lemmon.*

**Talinum calycinum** Engelm. in Wisliz. Mem. North. Mex. 88. 1848.

"In sandy soil on the Cimarron," *Wislizenus* in 1846.

This may have been collected in New Mexico, but it seems doubtful. Wislizenus's party crossed the Cimarron, according to his map, in about latitude 37° 10′, longitude 102° 30′, or in Kansas. However, there are several branches of the Cimarron, some of them in New Mexico, and this Talinum may have been gotten in New Mexican territory.

**Talinum confertiflorum** Greene, Bull. Torrey Club **8:** 121. 1881.

"In the Pinos Altos Mountains," *E. L. Greene* in 1880.

**Talinum humile** Greene, Bot. Gaz. **6:** 183. 1881.

"On a rocky table-land near the southern base of the Pinos Altos Mountains," August 11, 1880, *E. L. Greene.*

## SILENACEAE.

**Arenaria confusa** Rydb. Bull. Torrey Club **28:** 275. 1901.

"White Mountains," *E. O. Wooton* 295, August 6, 1897.

Collected at Gilmores Ranch.

**Arenaria fendleri** A. Gray, Mem. Amer. Acad. II. **4:** 13. 1849.

"Prairies 5 miles west of Las Vegas," August, 1847, *Fendler* 57 (not distributed).

A common species, occurring usually at rather high altitudes, in grassy meadows. It is common in the range to the west of Las Vegas, and in the Santa Fe Mountains.

**Arenaria saxosa** A. Gray, Smiths. Contr. Knowl. **5:** 18. 1853.

"Stony hills at the copper mines," *Wright* 865 in 1851.

**Cerastium fastigiatum** Greene, Pittonia **4:** 303. 1901.

"Pinos Altos Mountains," *E. L. Greene.*

**Drymaria depressa** Greene, Leaflets **1:** 153. 1905.

"Open glades of the Black Range," 1904, *O. B. Metcalfe* 1430, altitude, 2,900 meters.

**Drymaria fendleri** S. Wats. Proc. Amer. Acad. **17:** 328. 1882.

"New Mexico," 1847, *Fendler* 60 (other localities mentioned).

**Drymaria sperguloides** A. Gray, Mem. Amer. Acad. II. **4:** 11. 1849.

"Valley of Santa Fe Creek in the mountains, in a plain grazed by cattle and horses;" also "between Santa Fe and Pecos," August, 1847, *Fendler* 55 (not distributed).

**Drymaria tenella** A. Gray, Mem. Amer. Acad. II. **4:** 12. 1849.

"Shady places, in woodland in the mountain region, 8 miles west of Las Vegas," August, 1847, *Fendler* 56 (not distributed).

**Silene concolor** Greene, Leaflets **1:** 153. 1905.

"Black Range, New Mexico, in spruce woods at 8,000 feet," October 11, 1904, *O. B. Metcalfe* 1482.

**Silene wrightii** A. Gray, Smiths. Contr. Knowl. **5:** 17. 1853.

"In crevices of rocks, mountain sides near the copper mines," *Wright* 862 in 1851.

## RANUNCULACEAE.

**Aconitum mogollonicum** Greene, Repert. Nov. Sp. Fedde **7:** 5. 1909.
"Mogollon Mountains," *O. B. Metcalfe* 518 in 1903.

**Aconitum robertianum** Greene, Repert. Nov. Sp. Fedde **7:** 6. 1909.
"Pecos Baldy," *Vernon Bailey.*

**Aquilegia chrysantha** A. Gray, Proc. Amer. Acad. **8:** 621. 1873.
A new name for *A. leptocera flava*, A. Gray.

Doctor Gray speaks of this plant grown in the Cambridge Botanical Garden as being 4 feet high or more. This size must have been due to the larger amount of water received by the plants at Cambridge, for in the type locality it is never more than 2 feet high. It grows in damp places, especially about pools of water, in the Organ Mountains, flowering throughout the summer.

**Aquilegia leptocera flava** A. Gray, Smiths. Contr. Knowl. **5:** 9. 1853.
=*Aquilegia chrysantha* A. Gray.
"Wet places in a ravine, Organ Mountains," *Wright* 1306 in 1851.

**Clematis bigelovii** Torr. Pac. R. Rep. **4:** 61. 1856.
"On the Sandia Mountains," October, 1853, *Bigelow.*

**Clematis cruxflava** Cockerell, Science n. ser. **10:** 898. 1899.
A name applied to a plant found "along the roadside in the town of Las Vegas," thought to have escaped from cultivation.

**Clematis occidentalis albiflora** Cockerell, Bot. Gaz. **29:** 281. 1900.
=*Atragene* sp.
"Beulah," *T. D. A. Cockerell.*

**Delphinium amplibracteatum** Wooton, Bull. Torrey Club **37:** 35. 1910.
"At the N Bar Ranch in the Mogollon Mountains," at an altitude of about 2,100 meters in open pine forest, *E. O. Wooton*, August 2, 1900.

**Delphinium cockerellii** A. Nelson, Bot. Gaz. **42:** 51. 1906.
"Baldy Mountains, Elizabethtown," *Mrs. O. St. John* 90.

**Delphinium confertiflorum** Wooton, Bull. Torrey Club **37:** 33. 1910.
"In the mountains 15 miles southeast of Patterson, New Mexico, near Culberson's Ranch, in pine forest," altitude 2,300 meters, *E. O. Wooton*, August 16, 1900.

**Delphinium macrophyllum** Wooton, Bull. Torrey Club **37:** 40. 1910.
"On Hillsboro Peak of the Black Range, Sierra County," altitude 3,000 meters, *O. B. Metcalfe* 1311, September 11, 1904.

**Delphinium novomexicanum** Wooton, Bull. Torrey Club **37:** 37. 1910.
"Near Cloudcroft, Otero County," altitude, 2,700 meters, in open coniferous forests, *E. O. Wooton*, July 31, 1899.

**Delphinium sapellonis** Cockerell, Bot. Gaz. **34:** 453. 1902.
"Beulah, Sapello Cañon," August 11, 1900, *T. D. A. Cockerell*, described from life.

A common plant of the Las Vegas and Santa Fe mountains, growing along the edges of streams, at altitudes of 2,250 to 2,700 meters.

**Delphinium scaposum** Greene, Bot. Gaz. **6:** 156. 1881.
"Hill country between the Gila and San Francisco rivers," May 25, 1880, *E. L. Greene.*

**Delphinium scopulorum** A. Gray, Smiths. Contr. Knowl. **5:** 9. 1853.
"Mountain ravine, near the Mimbres," *Wright* 842 in 1851.

**Delphinium sierraeblancae** Wooton, Bull. Torrey Club **37:** 38. 1910.

"Upper slopes of the White Mountain Peak at elevations of from 3,200 meters down to about 2,500 meters," *E. O. Wooton*, August 1, 1901.

**Delphinium wootoni** Rydb. Bull. Torrey Club **26:** 587. 1899.

"Organ Mountains," *E. O. Wooton* in 1893.

Infrequent in the foothills of the Organs and the surrounding plains, flowering in spring.

**Ranunculus nudatus** Greene, Leaflets **1:** 211. 1906.

"Burro Mountains, at 7,500 feet," June 20, 1903, *O. B. Metcalfe.*

**Thalictrum cheilanthoides** Greene, Leaflets **2:** 89. 1910.

"Summit of Bald Peak not far from Santa Fe, New Mexico, at 12,000 feet," July 11, 1908, *Paul C. Standley* 4324.

By "Bald Peak" is meant Pecos Baldy.

**Thalictrum fendleri** Engelm. in A. Gray, Mem. Amer. Acad. II. **4:** 5. 1849.

"With the last," *Actaea rubra*, the locality for which is "damp, shady places in the mountains around Santa Fe," *Fendler* 13 in 1847.

A common species of the Santa Fe Mountains, most common in shady places along the banks of streams. Fendler found it probably along Santa Fe Creek.

**Thalictrum fendleri polycarpum** Torr. Pac. R. Rep. **4:** 61. 1856.

=*Thalictrum polycarpum* (Torr.) S. Wats.

"Mountain ravines, New Mexico," October, *Bigelow;* also collected in California.

## BERBERIDACEAE.

**Berberis fendleri** A. Gray, Mem. Amer. Acad. II. **4:** 5. 1849.

"Santa Fe Creek, at the foot of steep and rocky banks, near the water," *Fendler* 15 in 1847.

A common shrub on hillsides, from 2,250 meters or less up to about 2,700 meters.

**Berberis haematocarpa** Wooton, Bull. Torrey Club **25:** 304. 1898.

"At the Mescalero Agency in the White Mountains," August 23, 1897, *E. O. Wooton* 376, at 1,900 meters; also in the Organ Mountains.

## PAPAVERACEAE.

**Argemone hispida** A. Gray, Mem. Amer. Acad. II. **4:** 5. 1849.

"Low, sandy places around Santa Fe," *Fendler* 16 in 1847.

**Argemone pleiacantha** Greene, Repert. Nov. Sp. Fedde **6:** 161. 1908.

"Mountains near Kingston, in gravelly soil," *O. B. Metcalfe* in 1904.

**Argemone squarrosa** Greene, Pittonia **4:** 68. 1899.

"Southern New Mexico," *Miss Josephine Skekan*, near Gray, August, 1898.

## FUMARIACEAE.

**Corydalis montana** Engelm. in A. Gray, Mem. Amer. Acad. II. **4:** 6. 1849.

=*Capnoides montanum* (Engelm.) Britton.

"Rocks, Santa Fe Creek," *Fendler* in 1847.

Of frequent occurrence, on hillsides, or more commonly along the edge of streams.

## BRASSICACEAE.

**Arabis formosa** Greene, Pittonia **4:** 198. 1900.
"Hills about Aztec," April 28, 1899, *C. F. Baker.*

**Arabis gracilenta** Greene, Pittonia **4:** 194. 1900.
"Vicinity of Santa Fe," *A. A. Heller* in 1897.

**Arabis holboellii fendleri** S. Wats. in A. Gray, Syn. Fl. **1**[1]**:** 164. 1895.
=*A. fendleri* (S. Wats.) Greene.
"New Mexico," 1847, *Fendler* 27 (other localities mentioned).

**Cardamine cordifolia** A. Gray, Mem. Amer. Acad. II. **4:** 8. 1849.
"Margin of Santa Fe Creek, in the mountains," May and June, 1847, *Fendler* 28.
Common in wet places in the Santa Fe Mountains, chiefly along the edges of streams, from 2,250 or 2,400 meters up to 3,600 meters.

**Cheiranthus aridus** Greene, Pittonia **4:** 198. 1900.
=*Erysimum bakeri* (Greene) Rydb., according to Rydberg.
"On dry hills among nut pines and cedars at Aztec," April 27, 1899, *C. F. Baker.*

**Disaccanthus luteus** Greene, Leaflets **1:** 225. 1906.
"Black Range," *O. B. Metcalfe* in 1905.

**Disaccanthus mogollonicus** Greene, Leaflets **1:** 225. 1906.
"Among foothills of the Mogollones," March 30, 1881, *E. L. Greene.*

**Dithyraea wislizeni** Engelm. in Wisliz. Mem. North. Mex. 96. 1848.
"In sandy soil near Valverde and Fray Cristobal," *Wislizenus* in 1846.
Abundant upon the sandy mesas of southern New Mexico. The type locality is just at the upper end of the Jornada del Muerto, and this is one of the common flowers of early spring and summer upon this sandy plain.

**Draba aurea stylosa** A. Gray, Amer. Journ. Sci. II. **33:** 243.
"Near Santa Fe," *Fendler* in 1847.

**Draba helleriana** Greene, Pittonia **4:** 17. 1899.
"In cañons among foothills of New Mexican mountains at elevations of 7,000 to 8,000 feet," *A. A. Heller* 3669 in 1897; and *E. O. Wooton* 275 in 1897.
Professor Heller's specimens were collected somewhere in the region about Santa Fe. There the plant is common, growing on hillsides east of Santa Fe, under pine trees, on rather dry slopes. It flowers about the middle of July.

**Draba mogollonica** Greene, Bot. Gaz. **6:** 157. 1881.
"Northward slopes of the Mogollon Mountains," April 18, 1880, *E. L. Greene.*

**Draba neomexicana** Greene, Pittonia **4:** 18. 1899.
"Mountains back of Santa Fe," *Fendler* 43 in 1847, in part.

**Draba neomexicana robusta** Heller, Bull. Torrey Club **26:** 626. 1899.
New Mexico, *Fendler* 43 of 1847, in part.
This must have been collected in the mountains east of Santa Fe.

**Draba pallida** Heller, Bull. Torrey Club **26:** 626. 1899.
"Shady hillsides, Mogollon Mountains," August, 1881, *H. H. Rusby* 18.

**Draba patens** Greene, Bull. Torrey Club **26:** 624. 1899.
'White Mountains," *E. O. Wooton* 275, August 4, 1897.
Exact locality, Gilmores Ranch.

**Draba pinetorum** Greene, Pittonia **4:** 18. 1899.

"In pine woods along the summit of the Pinos Altos Mountains," September 6, 1880, *E. L. Greene.*

**Lepidium alyssoides** A. Gray, Mem. Amer. Acad. II. **4:** 10. 1849.

"Mountain valleys, from Santa Fe eastward to Rabbits Ear Creek," August, 1847, *Fendler* 46.

**Lepidium eastwoodiae** Wooton, Bull. Torrey Club **25:** 258. 1898.

"Mescalero Agency in the White Mountains," July 26, 1897, *E. O. Wooton* 672, altitude 1,900 meters.

**Lepidium intermedium** A. Gray, Smiths. Contr. Knowl. **5:** 15. 1853.

=*Lepidium medium* Greene.

"Ravines of the Organ Mountains," *Wright* 1320 in 1851.

Occurring in this locality on the foothills and on dry slopes, flowering in early spring.

**Lepidium intermedium pubescens** Greene, Bot. Gaz. **5:** 157. 1881.

"Mangos Springs," May 31, 1880, *E. L. Greene*, "in marshy ground."

This should read Mangas Springs.

**Lepidium thurberi** Wooton, Bull. Torrey Club **25:** 259. 1898.

"First collected by Dr. Geo. Thurber, at the Copper mines, near what is now Silver City," in 1851, no. 323.

**Lesquerella alpina intermedia** S. Wats. Proc. Amer. Acad. **23:** 251. 1888.

"On the lesser hills west of Santa Fe."

**Lesquerella aurea** Wooton, Bull. Torrey Club **25:** 260. 1898.

"On the south fork of Tularosa Creek, 3 miles east of the Mescalero Agency in the White Mountains," July 30, 1897, *E. O. Wooton* 245, altitude 1,950 meters.

**Lesquerella valida** Greene, Pittonia **4:** 68. 1899.

"At Gray," *Miss Josephine Skehan* in 1898.

**Nasturtium sphaerocarpum** A. Gray, Mem. Amer. Acad. II. **4:** 6. 1849.

=*Radicula sphaerocarpa* (A. Gray) Greene.

"Low places along Santa Fe Creek," *Fendler* 21 in 1847.

In damp places in the mountains east of Santa Fe, up to 3,000 meters.

**Sisymbrium incisum** Engelm. in A. Gray, Mem. Amer. Acad. II. **4:** 8. 1849.

=*Sophia incisa* (Engelm.) Greene.

"Banks of streams in New Mexico; Santa Fe Creek and Mora River," June to August, 1847, *Fendler* 29, 30, and 31.

Of wide distribution in the mountains of the southwest; plentiful about Santa Fe along the edges of the streams in shade, but growing as far down as the town, along the edge of the creek.

**Sophia andrenarum** Cockerell, Bull. Torrey Club **28:** 48. 1901.

"Mesilla Park," *T. D. A. Cockerell.*

**Sophia andrenarum osmiarum** Cockerell, Bull. Torrey Club **28:** 48. 1901.

"Mesilla Park," *T. D. A. Cockerell.*

**Sophia halictorum** Cockerell, Bull. Torrey Club **25:** 460. 1898.

"Mesilla Park, New Mexico, in the zone of mesquite and *Atriplex canescens*, flowering in March and April and very abundant," *T. D. A. Cockerell.*

All three of these Sophias as well as *S. ochroleuca* are exceedingly abundant about the Agricultural College, where they were first collected. The four forms grow side by side and are the commonest spring plants in the locality, flowering from February until June.

**Sophia obtusa** Greene, Leaflets **1:** 96. 1904.

"In the Black Range," *O. B. Metcalfe* 1074 in 1904.

A rather common species of west-central New Mexico, judging from material in the herbarium of the New Mexico Agricultural College.

**Sophia ochroleuca** Wooton, Bull. Torrey Club **25:** 455. 1898.

"Mesilla Park," April, 1897, *J. D. Tinsley.*

**Sophia serrata** Greene, Leaflets **1:** 96. 1904.

"Same region as the above" (*S. obtusa*).

**Streptanthus linearifolius** A. Gray, Mem. Amer. Acad. II. **4:** 7. 1849.

=*Thelypodium linearifolium* (A. Gray) S. Wats.

"Mountainous regions from Santa Fe to Las Vegas, on sunny rocks," July and August, 1847, *Fendler* 24.

A well-distributed species, common about Santa Fe, growing most frequently in crevices of rocks.

**Streptanthus micranthus** A. Gray, Mem. Amer. Acad. II. **4:** 7. 1849.

=*Heterothrix micranthus* (A. Gray) Rydb.

"Margins of Santa Fe Creek," July, 1847, *Fendler* 23.

As common as *Thelypodium linearifolium*, and growing in similar situations.

**Thelypodium vaseyi** Coulter, Contr. Nat. Herb. **1:** 30. 1890.

"Mountains west of Las Vegas," *G. R. Vasey.*

A common plant at higher elevations in the Las Vegas Mountains, usually growing in open meadows at about 3,000 meters. In spite of its small flowers it is a very showy plant when growing in large masses, and is one of the most conspicuous plants of the region.

**Thlaspi fendleri** A. Gray, Smiths. Contr. Knowl. **5:** 14. 1853.

By inference, "Santa Fe Creek, in the mountains," *Fendler* in 1847.

Frequent at 2,100 to 2,700 meters or more, on rather dry slopes under pine trees.

**Thysanocarpus amplectens** Greene, Pittonia **3:** 87. 1896.

"In southwestern New Mexico," *E. L. Greene*, April 16, 1880.

**Vesicaria fendleri** A. Gray, Mem. Amer. Acad. II. **4:** 9. 1849.

=*Lesquerella fendleri* (A. Gray) S. Wats.

"On the smaller hills around Santa Fe," May 2, 1847, *Fendler* 40 (not distributed).

## CRASSULACEAE.

**Rhodiola neomexicana** Britton, Bull. N. Y. Bot. Gard. **3:** 38. 1903.

"White Mountain Peak," *E. O. Wooton.*

**Sedum cockerellii** Britton, Bull. N. Y. Bot. Gard. **3:** 41. 1903.

"Tuerto Mountain, east of Santa Fe," *T. D. A. Cockerell.*

**Sedum wootonii** Britton, Bull. N. Y. Bot. Gard. **3:** 44. 1903.

"Organ Mountains," *E. O. Wooton.*

## SAXIFRAGACEAE.

**Heuchera flavescens** Rydb. N. Amer. Fl. **22**[2]: 114. 1905.

"Santa Fe Canyon, 9 miles east of Santa Fe," *A. A. Heller* in 1897.

**Heuchera leptomeria** Greene, Leaflets **1:** 112. 1905.

"Organ Mountains," September 17, 1893, *E. O. Wooton.*

Common in the Organs at higher altitudes, growing in moist soil on shady slopes.

**Heuchera novomexicana** Wheelock, Bull. Torrey Club **17:** 200. 1890.
"New Mexico."

**Heuchera rubescens nana** A. Gray, Smiths. Contr. Knowl. **5:** 64. 1853.
=*Heuchera nana* (A. Gray) Rydb.
"With the preceding," *H. rubescens* from "crevices of rocks, on mountains near the copper mines," August, 1851, *Wright*.

**Heuchera sitgreavesii** Rydb. N. Amer. Fl. **22**[2]**:** 110. 1905.
"Near Camp 19, New Mexico," *Dr. S. W. Woodhouse*.
I suspect that this is in Arizona.

**Heuchera versicolor** Greene, Leaflets **1:** 112. 1905.
"On damp shady bluffs in the Black Range," August 3, 1904, *O. B. Metcalfe* 1203.

**Heuchera wootonii** Rydb. N. Amer. Fl. **22**[2]**:** 113. 1905.
"White Mountains," *E. O. Wooton*, August 5, 1897.
Collected at Gilmores ranch.

## HYDRANGEACEAE.

**Philidelphus argyrocalyx** Wooton, Bull. Torrey Club **25:** 452. 1898.
"On Eagle Creek in the White Mountains," in fruit August 14, 1897; in flower on Ruidoso Creek, June 30, 1897, *E. O. Wooton* 524; altitude 2,100 meters.

**Philadelphus ellipticus** Rydb. N. Amer. Fl. **22**[2]**:** 174. 1905.
"Near Mesilla Park," *J. D. Tinsley*.
This locality is undoubtedly wrong, for no Philadelphus grows within 12 miles of Mesilla Park. The specimens upon which the description was based must have been collected in the Organ Mountains.

**Philadelphus mearnsii** W. H. Evans, N. Amer. Fl. **22**[2]**:** 174. 1905.
"Near the Upper Corner Monument, Grant County," *E. A. Mearns*.

**Philadelphus microphyllus** A. Gray, Mem. Amer. Acad. II. **4:** 54. 1849.
"Santa Fe Creek, on sunny and steep sides of the mountains, between rocks, 11 miles above Santa Fe," June and July, 1847, *Fendler* 266.
Of rather infrequent occurrence in the Santa Fe Range.

## GROSSULARIACEAE.

**Ribes leptanthum** A. Gray, Mem. Amer. Acad. II. **4:** 53. 1849.
=*Grossularia leptantha* (A. Gray) Coville & Britton.
"Rocky banks of the Rio del Norte, and ravines near Santa Fe," May, 1847, *Fendler* 254.

**Ribes leptanthum veganum** Cockerell, Proc. Biol. Soc. Washington **15:** 99. 1902.
=*Grossularia leptantha* (A. Gray) Coville & Britton.
"Along the Gallinas River, from about 2 miles below Las Vegas to Las Valles," *T. D. A. Cockerell*.

**Ribes mescalerium** Coville, Proc. Biol. Soc. Washington **13:** 196. 1900.
"At Fresnal, Otero County," July 21, 1899, *E. O. Wooton*, at 2,160 meters.

**Ribes mogollonicum** Greene, Bull. Torrey Club **8:** 121. 1881.
=*Ribes wolfii* Rothrock.
"Deep, cold ravines near the summits of the Mogollon Mountains," *E. L. Greene* in April, 1881.

**Ribes pinetorum** Greene, Bot. Gaz. **6:** 157. 1881.

=*Grossularia pinetorum* (Greene) Coville & Britton.

"In woods of *Pinus ponderosa*, in the higher elevations of the Pinos Altos and Mogollon Mountains, flowering in April; fruit ripe in September," *E. L. Greene.*

## ROSACEAE.

**Amelanchier crenata** Greene, Pittonia **4:** 127. 1899.

"On rocky declivities near Aztec," April 23, 1899, *C. F. Baker.*

**Amelanchier rubescens** Greene, Pittonia **4:** 128. 1899.

"In arroyos and among the hills about Aztec," April 24, 1899, *C. F. Baker.*

**Cerasus crenulata** Greene, Proc. Biol. Soc. Washington **18:** 56. 1905.

"Mogollon Mountains, New Mexico, at 2,400 meters, August 23, 1903, *O. B. Metcalfe.*"

**Crataegus wootoniana** Eggleston, Torreya **7:** 236. 1907.

"Mogollon Mountains, on or near the west fork of the Gila River, Socorro County," August 23, 1903, *O. B. Metcalfe* 584, at 2,600 meters.

**Fallugia micrantha** Cockerell, Entomological News **1901:** 41. 1901.

"Near Mesilla Park," May 3, *T. D. A. Cockerell.*

**Fallugia paradoxa acuminata** Wooton, Bull. Torrey Club **25:** 306. 1898.

=*Fallugia acuminata* (Wooton) Rydb.

"On the mesa near Las Cruces," July 1, 1897, *E. O. Wooton* 65, altitude 1,300 meters.

Abundant in the locality, commonly found along the arroyos which run across the mesa rather than on the mesa proper, and extending into the lower parts of the mountains.

**Fragaria bracteata** Heller, Bull. Torrey Club **25:** 194. 1898.

"In a meadow along Santa Fe Creek, 9 miles east of Santa Fe, May 29, 1897, *A. A. Heller* 3615.

This strawberry is the one most commonly seen in the Santa Fe Mountains; its fruit is ripe about the middle of July. Its usual habitat is upon rather dry hillsides.

**Holodiscus australis** Heller, Bull. Torrey Club **25:** 194. 1898.

=*Sericotheca dumosa* (Nutt.) Rydb.

"In Santa Fe Canyon, 9 miles east of Santa Fe," July 12, 1897, *A. A. Heller* 3840; altitude 2,400 meters.

**Potentilla arachnoidea** Dougl.; Rydb. N. Amer. Fl. **22**[4]**:** 350. 1908.

"Valley of Santa Fe."

**Potentilla bicrenata** Rydb. Bull. Torrey Club **23:** 431. 1896.

"New Mexico," 1883, *C. D. Walcott* 66.

**Potentilla crinita** A. Gray, Mem. Amer. Acad. II. **4:** 41. 1849.

"Aiong Santa Fe Creek, and at the foot of hills, in sunny places," July, 1847, *Fendler* 199.

**Potentilla diffusa** A. Gray, Mem. Amer. Acad. II. **4:** 41. 1849.

=*Potentilla propinqua* Rydb.

"Moist soil, along Santa Fe Creek," June, 1847, *Fendler* 198.

**Potentilla ovalis** Lehm. Delect. Sem. Hort. Hamb. **1849:** 9. 1849.

=*Fragaria ovalis* (Lehm.) Rydb.

"New Mexico," *Fendler* 206 in 1847, collected somewhere about Santa Fe, doubtless.

**Potentilla propinqua** Rydb. Bull. Torrey Club **28:** 176. 1901.
"Along Santa Fe Creek."

**Potentilla sierraeblancae** Wooton & Rydb. Mem. Dept. Bot. Columbia Univ. **2:** 57. 1898.
"White Mountains," August 16, 1897, *E. O. Wooton* 469.
This plant was collected on the very top of White Mountain Peak.

**Potentilla subviscosa** Greene, Bull. Torrey Club **8:** 97. 1881.
"On a dry southward slope of the Mogollon Mountains," *E. L. Greene* in April, 1881.

**Potentilla thurberi** A. Gray, Mem. Amer. Acad. II. **5:** 318. 1854.
"Near Santa Rita del Cobre," August, 1851, *Thurber*.

**Rosa mirifica** Greene, Leaflets **2:** 62. 1910.
"In the Sierra Blanca," *E. O. Wooton* in 1897.
The type was collected near the Mescalero Agency.

**Rosa neomexicana** Cockerell, Entomological News **1901:** 41. 1901.
"Cloudcroft," *E. O. Wooton*.

**Rosa pecosensis** Cockerell, Proc. Acad. Phila. **1904:** 110. 1904.
"Pecos."

**Rosa praetincta** Cockerell, Proc. Acad. Phila. **1904:** 110. 1904.
"Pecos."

**Rosa stellata** Wooton, Bull. Torrey Club **25:** 152. 1898.
"Near the cueva in the Organ Mountains," *E. O. Wooton* in 1897.
The cueva (Spanish for cave) is on the west side of the Organs. This rose occurs in only one locality in the range, just east of the cueva, and it is not very abundant at this point.

**Rosa suffulta** Greene, Pittonia **4:** 12. 1899.
"From the meadows of the Rio Grande at Las Vegas," *G. R. Vasey*.
The description of the type locality will be slightly perplexing, to say the least, to those who are acquainted with the geography of New Mexico. The Rio Grande at the nearest point is about 90 miles from Las Vegas. One can only wonder which of the two places, the vicinity of Las Vegas or the banks of the Rio Grande, is the one where this rose was collected.

**Rubus neomexicanus** A. Gray, Smiths. Contr. Knowl. **5:** 55. 1853.
"Mountain sides at the copper mines," *Wright* 1061 in 1851.

**Rubus nutkanus parvifolius** A. Gray, Mem. Amer. Acad. II. **4:** 42. 1849.
"Shady banks of Santa Fe Creek," June, July, 1847, *Fendler* 208.

**Sorbus scopulina** Greene, Pittonia **4:** 130. 1899.
"Santa Fe Canyon," June, 1897, *A. A. Heller* 3711, at 2,400 meters (other collectors and localities mentioned).
A shrub not at all common in the type locality. It is found only on the west side of the Santa Fe Mountains and does not occur on their eastern slopes or in the Las Vegas Mountains, so far as the writer has been able to ascertain. It is found on shaded and rather damp hillsides.

## MIMOSACEAE.

**Acacia constricta paucispina** Wooton & Standley, Bull. Torrey Club **36:** 105. 1909.
"On Animas Creek, in the Black Range," July 13, 1904, *O. B. Metcalfe* 1123; altitude 1,500 meters.

## CAESALPINIACEAE.

**Calliandra? herbacea** Engelm. in A. Gray, Mem. Amer. Acad. II. **4:** 39. 1849.
"Between San Miguel and Las Vegas," August, 1847, *Fendler* 180 (not distributed).

**Calliandra reticulata** A. Gray, Smiths. Contr. Knowl. **5:** 53. 1853.
"Stony hills at the copper mines," *Wright* 1045 in 1851.

**Hoffmanseggia falcaria rusbyi** Fisher, Contr. Nat. Herb. **1:** 145. 1892.
"Mangas Springs," *H. H. Rusby.*

## FABACEAE.

**Aragallus metcalfei** Greene, Proc. Biol. Soc. Washington **18:** 12. 1905.
"In the Black Range, southern New Mexico, at 10,000 feet," *O. B. Metcalfe* in 1904.

**Aragallus pinetorum** Heller, Bull. Torrey Club **26:** 548. 1899.
"On gravelly hills thinly clothed with pine trees, at a point 11 miles southeast of Santa Fe," June 23, 1897, *A. A. Heller* 3751.

**Aragallus pinetorum veganus** Cockerell, Torreya **2:** 155. 1902.
"An exposed treeless limestone outcrop on the top of the Las Vegas Range, above the Sapello Canyon at about 11,000 feet," June 26, 1901, *Fabián Garcia.*

**Astragalus bigelovii** A. Gray, Smiths. Contr. Knowl. **5:** 42. 1853.
"On the Organ Mountains," *Wright* 1358 in 1851.
One of the most easily recognized loco weeds of the southwest, fortunately not very abundant in its type locality. It grows in the foothills and on the lower slopes of the Organs, preferring the drier and more sunny slopes; flowering in early spring.

**Astragalus cobrensis** A. Gray, Smiths. Contr. Knowl. **5:** 43. 1853.
"Near the Cobre or copper mines," *Bigelow.*

**Astragalus crescenticarpus** Sheldon, Minn. Bot. Stud. **1:** 148. 1894.
"On sandy plains north of Sulphur Springs, New Mexico," *G. R. Vasey.*

**Astragalus cyaneus** A. Gray, Mem. Amer. Acad. II. **4:** 34. 1849.
"Santa Fe, on gravelly hills and low mountains among rocks," April and May, 1847, *Fendler* 148.

**Astragalus diphysus** A. Gray, Mem. Amer. Acad. II. **4:** 34. 1849.
"Plains, around Santa Fe, in red sandy soil," April, May, 1847, *Fendler* 146.

**Astragalus diphysus albiflorus** A. Gray, Mem. Amer. Acad. II. **4:** 34. 1849.
"With the preceding," the species, *Fendler* 147 in 1847.

**Astragalus fallax** S. Wats. Proc. Amer. Acad. **20:** 362. 1885.
"Pine hills, from the Mimbres to the copper mines."

**Astragalus feensis** M. E. Jones, Contr. West. Bot. **8:** 20. 1898.
"Dry gravelly hills, Santa Fe," *Fendler* 151 in 1847.

**Astragalus gertrudis** Greene, Leaflets **2:** 43. 1910.
"Taos County." *Mr. & Mrs. A. A. Heller* 3598, May 27, 1897.

**Astragalus gilensis** Greene, Bull. Torrey Club **8:** 97. 1881.
"On a high summit at the mouth of the canyon of the Gila River," *E. L. Greene* in April, 1881.

**Astragalus greenei** A. Gray, Proc. Amer. Acad. **16:** 105. 1880.
"Foothills of the Mogollon Mountains," *E. L. Greene,* April 20, 1880.

**Astragalus humistratus** A. Gray, Smiths. Contr. Knowl. **5:** 43. 1853.
"Pebbly bed of a stream, and on hills under pine trees, near the copper mines," *Wright* 1003 in 1851.

**Astragalus lonchocarpus** Torr. in Pac. R. Rep. **4:** 80. 1856.
A new name for *Phaca macrocarpa* A. Gray.

**Astragalus matthewsii** S. Wats. Proc. Amer. Acad. **18:** 192. 1883.
"At Fort Wingate," *Dr. W. Matthews.*

**Astragalus mogollonicus** Greene, Bull. Torrey Club **8:** 97. 1881.
"Bleak, grassy summits of the middle elevations of the Mogollon Mountains," *E. L. Greene* in April, 1881.

**Astragalus oocalycis** M. E. Jones, Contr. West. Bot. **8:** 10. 1898.
"On bottom lands at Aztec."

**Astragalus procumbens** S. Wats. Proc. Amer. Acad. **20:** 361. 1885.
"Near Fort Wingate," *Dr. W. Matthews.*

**Astragalus rothrockii** Sheldon, Minn. Bot. Stud. **1:** 174. 1894.
"New Mexico," *J. T. Rothrock.*

**Astragalus simulans** Cockerell, Torreya **2:** 154. 1902.
"Stony hills at Las Vegas," May 18, 1901, *T. D. A. & Wilmatte P. Cockerell.*

**Astragalus tephrodes** A. Gray, Smiths. Contr. Knowl. **5:** 45. 1853.
"Plains at the base of the Organ Mountains," *Wright.*
Not uncommon in the Organ foothills, flowering in early spring.

**Astragalus vaccarum** A. Gray, Smiths. Contr. Knowl. **5:** 43. 1853.
"Ojo de Vaca, west of the copper mines," *Wright* 1002 in 1851.

**Astragalus wingatanus** S. Wats. Proc. Amer. Acad. **18:** 192. 1883.
"At Fort Wingate," *Dr. W. Matthews* in 1882.

**Astragalus wootoni** Sheldon, Minn. Bot. Stud. **1:** 138. 1894.
"Near Las Cruces," *E. O. Wooton.*
A flower of early spring, found only in adobe soil in the Rio Grande Valley. A similar but different species occurs in the Organ foothills a few miles away.

**Cologania longifolia** A. Gray, Smiths. Contr. Knowl. **5:** 35. 1853.
"Hills near the copper mines," *Wright* 961 in 1851.

**Dalea filiformis** A. Gray, Smiths. Contr. Knowl. **5:** 39. 1853.
=*Parosela filiformis* (A. Gray) Heller.
"Hillsides near the copper mines," *Wright* 992 in 1851.

**Dalea polygonoides** A. Gray, Smiths. Contr. Knowl. **5:** 39. 1853.
=*Parosela polygonoides* (A. Gray) Heller.
"Pebbly bed of mountain torrents, near the copper mines," *Wright* 991 in 1851.

**Dalea scariosa** S. Wats. Proc. Amer. Acad. **17:** 369. 1882.
=*Parosela scariosa* (S. Wats.) Heller.
"Near Albuquerque," *E. L. Greene* in 1877.

**Dalea scoparia** A. Gray, Mem. Amer. Acad. II. **4:** 32. 1849.
=*Parosela scoparia* (A. Gray) Heller.
"Jornada del Muerto, between Santa Fe and El Paso del Norte," August, 1846, *Wislizenus.*
A common and conspicuous shrub along the edge of the Jornada. Its favorite habitat seems to be the sand hills in the valley of the Rio Grande.

**Dalea urceolata** Greene, Leaflets **1:** 199. 1906.
=*Parosela urceolata* (Greene).
"Mogollon Mountains," August 20, 1903, *O. B. Metcalfe* 553.

**Dalea wislizeni sessilis** A. Gray, Proc. Amer. Acad. **16:** 105. 1880.
=*Parosela wislizeni sessilis* (A. Gray) Vail.
"New Mexico and Arizona," *Greene* in 1877, *Lemmon* in 1880.

**Desmodium grahami** A. Gray, Smiths. Contr. Knowl. **5:** 48. 1853.
=*Meibomia grahami* (A. Gray) Kuntze.
"On mountains near the copper mines," *Wright* 1015 in 1851.

**Desmodium neomexicanum** A. Gray, Smiths. Contr. Knowl. **5:** 53. 1852.
This is certainly Texan, the type coming from a locality 30 miles east of El Paso.

**Galactia tephrodes** A. Gray, Smiths. Contr. Knowl. **5:** 34. 1853.
"Mountain sides near Conde's camp between the copper mines and the Chiricahui [Chiricahua] Mountains," *Wright* 956, in 1851.

**Hosackia wrightii** A. Gray, Smiths. Contr. Knowl. **5:** 42. 1853.
=*Lotus wrightii* (A. Gray) Greene.
"Stony hills at the copper mines," *Wright* 1000 in 1851.

**Lathyrus oreophilus** Wooton & Standley, Muhlenbergia **5:** 87. 1909.
"In James Canyon, about 4 miles east of Cloudcroft, in the Sacramento Mountains," June 26, 1899, *E. O. Wooton.*

**Lathyrus palustris** var.? **graminifolius** S. Wats. Proc. Amer. Acad. **23:** 263. 1888.
"New Mexico."

**Lotus mollis** Greene, Pittonia **2:** 143. 1890.
"Organ Mountains."

**Lotus neomexicanus** Greene, Pittonia **2:** 144. 1890.
"Near Silver City," *E. L. Greene.*

**Lupinus aduncus** Greene, Pittonia **4:** 132. 1900.
"Dry ravines among the sandy hills at Aztec," May 2, 1899, *C. F. Baker.*

**Lupinus ammophilus** Greene, Pittonia **4:** 136. 1900.
"Sandy bottoms of dry streams at Aztec," April 20, 1899, *C. F. Baker* (Colorado localities mentioned besides).

**Lupinus decumbens argophyllus** A. Gray, Mem. Amer. Acad. II. **4:** 37. 1849.
=*Lupinus argophyllus* (A. Gray) Cockerell.
"Plains around Santa Fe," May to August, 1847, *Fendler* 166.
One of the handsomest and most conspicuous flowers upon the mesas and in the foothills of the mountains about Santa Fe.

**Lupinus helleri** Greene, Pittonia **4:** 134. 1900.
"Canyon 1 mile southeast of Santa Fe," *A. A. Heller* 3557, in 1897.

**Lupinus ingratus** Greene, Pittonia **4:** 133. 1900.
"Frequent in low grassy lands at Chama," September 2, 1899, *C. F. Baker.*

**Lupinus neomexicanus** Greene, Pittonia **4:** 133. 1900.
"About Silver City and in foothills of the Pinos Altos Mountains," *E. L. Greene* in 1877 and 1880.

**Meibomia metcalfei** Rose & Painter, Bot. Gaz. **40:** 144. 1905.
"In the Black Range, Animas Creek, Grant County, New Mexico, on ditch banks, altitude 1,500 meters," July 13, 1904, *O. B. Metcalfe* 1137.
In the original the name of the collector was given wrongly Metcalf and the specific name of the plant as *metcalfii*.

**Parryella filifolia** Torr. & Gray, Proc. Amer. Acad. **7**: 397. 1867.
"Along the Rio Grande below Albuquerque," *Dr. C. C. Parry.*

**Petalostemon gracile oligophyllum** Torr. in Emory, Mil. Recon. 139. 1849.
=*Petalostemon oligophyllum* (Torr.) Rydb.
"Valley of the del Norte," *Emory* in 1847.

**Phaca fendleri** A. Gray, Mem. Amer. Acad. II. **4**: 36. 1849.
=*Astragalus fendleri* A. Gray.
"Woodlands in the mountains between Santa Fe and Pecos," August, 1847, *Fendler* 157.

**Phaca gracilenta** A. Gray, Mem. Amer. Acad. II. **4**: 36. 1849.
=*Astragalus gracilentus.*
"Bare, rocky hills, Santa Fe," April to June, 1847, *Fendler* 159.

**Phaca macrocarpa** A. Gray, Mem. Amer. Acad. II. **4**: 36. 1849.
=*Astragalus lonchocarpus* Torr.
"Rocky declivities near Santa Fe," June, 1847, *Fendler* 160.

**Phaca picta** A. Gray, Mem. Amer. Acad. II. **4**: 37. 1849.
=*Astragalus* sp.
"Loose, sandy soil on the banks of the Rio del Norte, especially among low shrubs," April and June, 1847, *Fendler* 161.

**Phaseolus acutifolius tenuifolius** A. Gray, Smiths. Contr. Knowl. **5**: 33. 1853.
"Mountain sides near the copper mines," *Wright* 950, in 1851.

**Phaseolus angustissimus** A. Gray, Smiths. Contr. Knowl. **5**: 33. 1853.
"Stony hillsides at the crossing of the Rio Grande above Dona Ana," *Wright* 951 in 1851.
A species peculiar to the Rio Grande Valley, apparently. It is not at all abundant, but is found occasionally along the ditch banks and in other similar locations.

**Phaseolus macropoides** A. Gray, Smiths. Contr. Knowl. **5**: 33. 1853.
"Stony hills at the copper mines," *Wright* 953 in 1851.

**Phaseolus parvulus** Greene, Bot. Gaz. **6**: 217. 1881.
"Abundant in deep woods of *Pinus ponderosa*, in the Pinos Altos Mountains," "flowering in August," *E. L. Greene.*

**Robinia neomexicana** A. Gray, Mem. Amer. Acad. II. **5**: 314. 1854.
"Dry hills on the Mimbres," May, 1851, *Thurber.*
The exact locality is said to have been 8 miles from the copper mines.

**Trifolium fendleri** Greene, Pittonia **3**: 221. 1897.
"Wet meadows and about cold springy places in the mountain parks of southern Colorado and northern New Mexico; also along irrigating ditches among the lower foothills and on the plains, here an immigrant from its native subalpine stations."
From its specific name it is to be inferred that Fendler's collection from the vicinity of Santa Fe is to be taken as the type. If this is true the plant found about Santa Fe, the only native Trifolium in the region, is not a subalpine plant at all. In the Santa Fe Mountains I have never seen it growing above about 2,250 meters.

**Vicia leucophaea** Greene, Bot. Gaz. **6**: 217. 1881.
"Along streams in the higher mountains of southwestern New Mexico, flowering in July and August," *E. L. Greene.*

## GERANIACEAE.

**Geranium atropurpurem** Heller, Bull. Torrey Club **25:** 195. 1898.
=*Geranium gracile* Engelm.
"Along Santa Fe Creek," June to July, 1897, *A. A. Heller* 2723.

**Geranium fremontii** Torr. in A. Gray, Mem. Amer. Acad. II. **4:** 26. 1849.
"Bottom lands of the Mora River among shrubs," August, 1847, *Fendler* 90 (not distributed).
In the North American Flora Dr. J. K. Small gives the type locality incorrectly, as the "Moro" River.

**Geranium pentagynum** Engelm. in Wisliz. Mem. North. Mex. 90. 184. 1848.
=*Geranium richardsonii* Fisch. & Trautv.
"On Wolf Creek," *Wislizenus* in 1846.

## LINACEAE.

**Linum australe** Heller, Bull. Torrey Club **25:** 627. 1898.
=*Cathartolinum australe* (Heller) Small.
"On an open slope in dry ground, at the head of the reservoir, 4 miles east of Santa Fe," June 17, 1897, *A. A. Heller* 3724.

**Linum neomexicanum** Greene, Bot. Gaz. **6:** 183. 1881.
=*Cathartolinum neomexicanum* (Greene) Small.
"In woods of *Pinus ponderosa* on the Pinos Altos Mountains," August, September, 1880, *E. L. Greene.*

**Linum rigidum puberulum** Engelm. in A. Gray, Smiths. Contr. Knowl. **3:** 25. 1852.
=*Cathartolinum puberulum* (Engelm.) Small.
"Santa Fe to the Cimarron River," *Fendler* 85, in 1847.

**Linum vernale** Wooton, Bull. Torrey Club **25:** 452. 1898.
=*Cathartolinum vernale* (Wooton) Small.
"The base of a small mountain, generally called Tortugas, standing alone on the mesa about 5 miles east of Las Cruces," April 22, 1893, and July 1, 1897, *E. O. Wooton* 589.
A very common plant, not only upon Tortugas Mountain but upon the surrounding mesa as well.

## OXALIDACEAE.

**Ionoxalis caerulea** Small, N. Amer. Fl. **25**[1]: 33. 1907.
"In Lincoln County," June 7, 1898, *Miss Josephine Skehan* 112.

**Ionoxalis grayi** Rose, Contr. Nat. Herb. **10:** 112. 1906.
"At the copper mines," *Wright* in 1851.

**Ionoxalis metcalfei** Small, N. Amer. Fl. **25**[2]: 39. 1907.
"On the Mogollon Mountains, Socorro County," July 23, 1903, *O. B. Metcalfe* 299.

**Ionoxalis monticola** Small, N. Amer. Fl. **25**[2]: 42. 1907.
"At Iron Creek, Grant County," August 12, 1904, *O. B. Metcalfe* 1220.

## ZYGOPHYLLACEAE.

**Kallstroemia brachystylis** Vail, Bull. Torrey Club **24:** 206. 1897.
"Mesa near Las Cruces," *E. O. Wooton.*
A common weed, not only upon the mesa but more commonly in adobe soil in the Rio Grande Valley.

**Kallstroemia hirsutissima** Vail in Small, Fl. Southeast. U. S. 670. 1903.
"Dona Ana Co.," *E. O. Wooton* 564 in 1897.

**Larrea glutinosa** Engelm. in Wisliz. Mem. North. Mex. 93. 1848.
=*Covillea glutinosa* (Engelm.) Rydb.
"Olla and Fray Cristobal," *Wislizenus* in 1846.

## RUTACEAE.

**Astrophyllum dumosum** Torr. Pac. R. Rep. **2:** 161. 1855.
=*Choisya dumosa* (Torr.) A. Gray.
"On the Organ Mountains," *Pope* in 1854.
This interesting plant is not known to occur in the Organs proper, but it is found just to the north in the San Andreas Range, and perhaps it was first collected there. Whether or not it is found in the Franklin Mountains to the south I do not know. Pope passed through the pass between the Organs and the San Andreas, so that it is probable that he saw the shrub there.

**Ptelea formosa** Greene, Contr. Nat. Herb. **10:** 59. 1906.
"Sierra Blanca," August 17, 1897, *E. O. Wooton* 657, at 2,120 meters.
Collected at Gilmores Ranch on Eagle Creek.

**Ptelea neomexicana** Greene, Contr. Nat. Herb. **10:** 68. 1906.
"In the Black Range," October 4, 1904, at 2,270 meters, *O. B. Metcalfe* 1479.

**Ptelea parvula** Greene, Contr. Nat. Herb. **10:** 64. 1906.
"Summit of the Sierra Blanca," August 1, 1897, *E. O. Wooton* 658.
Doctor Greene says, in discussing this plant, that it was collected at an "altitude of 6,300 feet, which is about that of the summit." This is a mistake, for the summit of the range reaches an elevation of almost 12,000 feet. The specimens were collected at the Mescalero Agency, which is much lower.

**Ptelea subvestita** Greene, Contr. Nat. Herb. **10:** 67. 1906.
"Dry hills about Silver City and Fort Bayard," July 20, 1880, *E. L. Greene.*

**Ptelea undulata** Greene, Contr. Nat. Herb. **10:** 62. 1906.
"Probably of the Burro Mountains," July 17, 1880, *H. H. Rusby* 111.

**Ptelea villosula** Greene, Contr. Nat. Herb. **10:** 60. 1906.
"Known only from the isolated Organ Mountains," July 11 1897, *E. O. Wooton* 134.
One of the more abundant shrubs in the Organs, found only at the lower altitudes.

## POLYGALACEAE.

**Monnina wrightii** A. Gray, Smiths. Contr. Knowl. **5:** 31. 1853.
"Crevices of rocks, mountain sides, near the copper mines," *Wright* 938 in 1851.

## EUPHORBIACEAE.

**Acalypha neomexicana** Muell. Linnaea **34:** 19. 1865.
"In Novo-Mexico," *Wright* 1817 and 1819 in 1851.
Doubtfully New Mexican.

**Argyrothamnia neomexicana** Muell. Linnaea **34:** 147. 1865.
=*Ditaxis neomexicana* (Muell.) Heller.
"In Novo-Mexico," *Wright* 643 and 1797.
The first of these numbers is certainly Texan; the second may be New Mexican.

**Croton neomexicanus** Muell. Linnaea **34:** 141. 1865.

"In Novo-Mexico inter Western Texas et El Paso," *Wright* 642.

The description of this locality would be truly amazing if it were to be given to-day. It refers, of course, to a Texan collection.

**Ditaxis cyanophylla** Wooton & Standley, Bull. Torrey Club **36:** 106. 1909.

"Kingston, Sierra County," "growing in dry gravel; altitude about 2,100 meters," May 25, 1904, *O. B. Metcalfe.*

**Euphorbia bilobata** Engelm. in Torr. Bot. Mex. Bound. 190. 1859.

=*Zygophyllidium bilobatum* (Engelm.).

"Near the Copper Mines," *Bigelow* (other localities and collectors mentioned).

**Euphorbia dentata cuphosperma** Engelm. in Torr. Bot. Mex. Bound. 190. 1859.

=*Poinsettia cuphosperma* (Engelm.) Small.

"Copper mines," *Wright* 1834 in 1851 (also in Sonora and Chihuahua).

**Euphorbia dioica** var.? **indivisa** Engelm. in Torr. Bot. Mex. Bound. 187. 1859.

=*Chamaesyce* sp.

"Near the Copper Mines," *Wright* 1845 in 1851; also collected in Sonora by Thurber.

**Euphorbia fendleri** Torr. & Gray, Pac. R. Rep. **2:** 175. 1855.

=*Chamaesyce fendleri* (Torr. & Gray) Small.

"New Mexico," *Fendler* 800 in 1847, collected somewhere near Santa Fe, probably. It is common on the dry foothills and mesas about Santa Fe.

**Euphorbia montana gracilior** Engelm. in Torr. Bot. Mex. Bound. 192. 1859.

=*Tithymalus* sp.

"In New Mexico," *Fendler* 786, probably from the Santa Fe region; also *Wright* 661 (undoubtedly Texan) and 1825.

**Euphorbia neomexicana** Greene, Bull. Calif. Acad. **2:** 55. 1886.

=*Chamaesyce neomexicana* (Greene).

"On the plains of the upper Gila in western New Mexico," *E. L. Greene.*

**Tragia stylaris** Muell. Linnaea **34:** 180. 1865.

Under this citation no type was designated for the species proper, but instead the plant is described as having three forms. Of these the first is *latifolia.* The type of this was collected "in Novo-Mexico," by Fendler in 1847 (no. 776), in all probability somewhere around Santa Fe. The other two forms are Texan.

## ANACARDIACEAE.

**Rhus sorbifolia** Greene, Proc. Biol. Soc. Washington **8:** 195. 1906.

"Mountains west of Las Vegas."

**Rhus trilobata mollis** A. Gray; Patterson, Check List 21. 1892.

=*Schmaltzia* sp.

"Organ Mountains," *Wright.*

**Schmaltzia emoryi** Greene, Leaflets **1:** 133. 1905.

"Hills and low mountains of eastern and southern New Mexico," etc., "first collected on Emory's expedition."

**Schmaltzia leiocarpa** Greene, Leaflets **1:** 133. 1905.

"Valley of the Rio Grande at Mesilla," *E. O. Wooton* 48 in 1897.

**Toxicodendron punctatum** Greene, Leaflets **1:** 125. 1905.

"From the Black Range of mountains in southern New Mexico," *O. B. Metcalfe* 1088 in 1904.

## ACERACEAE.

**Acer neomexicanum** Greene, Pittonia **5:** 3. 1902.

"From the mountains near Las Vegas," *G. R. Vasey* in 1881 (also collected by others in other localities).

## RHAMNACEAE.

**Ceanothus fendleri** A. Gray, Mem. Amer. Acad. II. **4:** 29. 1849.

"Mountains east of Santa Fe, in sunny places," June and July, 1847, *Fendler* 106.

At altitudes of 2,250 to about 2,650 meters throughout the Santa Fe and Las Vegas mountains, common on open and rather dry hillsides.

**Ceanothus mogollonicus** Greene, Leaflets **1:** 67. 1904.

"On Mogollon Creek in the Mogollan Mountains, New Mexico, at 8,000 feet," "July 16, 1893," *O. B. Metcalfe.*

Mogollan is a misprint for Mogollon; and instead of 1893 the year should be 1903.

**Rhamnus betulaefolia** Greene, Pittonia **3:** 16. 1896.

"Banks of streams in the Mogollon Mountains," *H. H. Rusby* in 1881.

**Rhamnus fasciculata** Greene, Leaflets **1:** 63. 1904.

"White Mountains," July 25, 1897, *E. O. Wooton.*

Collected on the south fork of Tularosa Creek, 3 miles east of the Mescalero Agency.

**Rhamnus ursina** Greene, Leaflets **1:** 63. 1904.

"On Bear Mountain near Silver City," June 17, 1903, *O. B. Metcalfe.*

## MALVACEAE.

**Anoda pentaschista** A. Gray, Smiths. Contr. Knowl. **5:** 22. 1853.

"Valley between Ojo de Gavilan and Conde's Camp, beyond the copper mines," *Wright* 893 in 1851.

**Anoda wrightii** A. Gray, Smiths. Contr. Knowl. **5:** 22. 1853.

"On the summit of mountains near the copper mines," *Wright* 894 in 1851.

**Malvastrum cockerellii** A. Nelson, Bot. Gaz. **34:** 24. 1902.

(By inference) "At Las Vegas," *T. D. A. Cockerell.*

**Malvastrum digitatum** Greene, Leaflets **1:** 154. 1905.

"Kingston," June, 1904, *O. B. Metcalfe* 941.

**Sida neomexicana** A. Gray, Proc. Amer. Acad. **22:** 296. 1887.

"On mountains at the copper mines."

**Sidalcea candida** A. Gray, Mem. Amer. Acad. II. **4:** 24. 1849.

"Along Santa Fe Creek," June, July, 1847, *Fendler* 80.

Found usually at the very edge of the water, not only east of Santa Fe but in all the surrounding mountains.

**Sidalcea candida tincta** Cockerell, Bot. Gaz. **29:** 280. 1900.

"Harvey's Ranch, near Las Vegas," *T. D. A. Cockerell.*

**Sidalcea neomexicana** A. Gray, Mem. Amer. Acad. II. **4:** 23. 1849.

"Moist meadows, Santa Fe," June, July, 1847, *Fendler* 79.

Common in locations similar to those in which *S. candida* is found.

**Sphaeralcea emoryi** Torr. in A. Gray, Mem. Amer. Acad. II. **4:** 23. 1849.

"Southern New Mexico," *Emory* in 1847.

**Sphaeralcea fendleri** A. Gray, Mem. Amer. Acad. II. **4:** 29. 1849.

"Fields and wet meadows, Santa Fe," June, 1847, *Fendler* 78.

Abundant in rather dry places about Santa Fe, growing with and often confused with *S. lobata* from which it is abundantly distinct. The differences between it and the latter species are more evident in the field than in dried specimens.

**Sphaeralcea glabrescens** Wooton & Standley, Bull. Torrey Club **36:** 107. 1909.

"At Providencia Lake, about 30 miles west of Las Cruces," July 3, 1900, *E. O. Wooton.*

**Sphaeralcea incana** Torr. in A. Gray, Mem. Amer. Acad. II. **4:** 23. 1849.

"In New Mexico," *Abert.*

**Sphaeralcea incana** var.? **dissecta** A. Gray, Smiths. Contr. Knowl. **3:** 21. 1852.

"Ojo del Muerto," *Wislizenus* in 1846.

**Sphaeralcea laxa** Wooton & Standley, Bull. Torrey Club **36:** 108. 1909.

"At Frisco, Socorro County," July 25, 1900, *E. O. Wooton.*

**Sphaeralcea leiocarpa** Wooton & Standley, Bull. Torrey Club **36:** 107. 1909.

"At Mangas Springs," September 24, 1903, *O. B. Metcalfe* 791, at 1,465 meters.

**Sphaeralcea lobata** Wooton, Bull. Torrey Club **25:** 306. 1898.

"Mesilla," July 14, 1897, *E. O. Wooton* 2; altitude 1,200 meters.

A troublesome weed in the Mesilla Valley, growing everywhere in cultivated fields, along ditches, and in waste land, flowering all summer. A species of a very wide range, apparently. It is the commonest one of the genus in New Mexico.

**Sphaeralcea lobata perpallida** Cockerell, Bull. Torrey Club **27:** 87. 1900.

"Occurs as a sport in the Mesilla Valley, New Mexico, but from Rincon, N. Mex., 20 miles or more northward along the railroad, it occurs to the exclusion of the type," *T. D. A. Cockerell.*

**Sphaeralcea martii** Cockerell, Bot. Gaz. **32:** 60. 1901.

"Picacho Mountain, Mesilla Valley," *T. D. A. Cockerell.*

An excellent species, known only from the type locality, which, on account of its inaccessibility, has been visited by botanists only two or three times.

**Sphaeralcea pumila** Wooton & Standley, Bull. Torrey Club **36:** 110. 1909.

"At the Diamond A Wells in the Silver City Draw, Grant County," July 1, 1906, *E. O. Wooton.*

**Sphaeralcea ribifolia** Wooton & Standley, Bull. Torrey Club **36:** 109. 1909.

"At the Martin and Sloan Ranch, Grant County," August 13, 1902, *E. O. Wooton.*

**Sphaeralcea simulans** Wooton & Standley, Bull. Torrey Club **36:** 109. 1909.

"On the plains both east and west of Deming," June 14 (type) and 13, 1906, *E. O. Wooton.*

**Sphaeralcea tripartita** Wooton & Standley, Bull. Torrey Club **36:** 108. 1909.

"At Kingston, Sierra County," "growing in dry gravel," July 10, 1904, *O. B. Metcalfe* 1103.

## FOUQUIERIACEAE.

**Fouquieria splendens** Engelm. in Wisliz. Mem. North. Mex. 98. 1848.

"Jornada del Muerto," *Wislizenus* in 1846.

Doctor Wislizenus makes no mention of this remarkable plant in his journal, so that we can not tell on just what part of the Jornada it was collected or first seen; but probably it was near the northern end of that plain. The shrub is conspicuous everywhere on the mesa east of the Rio Grande Valley in this locality, producing its flowers in spring but not putting out its leaves until July and August after the rains.

## VIOLACEAE.

**Viola neomexicana** Greene, Pittonia **5:** 28. 1902.

"Near Santa Fe," *A. A. Heller* 3645 in 1897; and "Mogollon Mountains," April 20, 1880, *E. L. Greene.*

About Santa Fe this violet is found only in the mountains, in moist places in the shade, at altitudes of 2,250 to 2,700 meters or more.

**Viola wilmattae** Pollard & Cockerell, Proc. Biol. Soc. Washington **15:** 178. 1902.

"In Sapello Canyon, Beulah," at 2,400 meters, *Mrs. Wilmatte P. Cockerell.*

## LOASACEAE.

**Bartonia multiflora** Nutt. Journ. Acad. Phila. n. ser. **1:** 180. 1848.

=*Touterea multiflora* (Nutt.) Rydb.

"Sandy hills along the borders of the Rio del Norte, Santa Fe," August, *William Gambel.*

No species of Touterea has a wider range than this one, perhaps. It occurs abundantly upon the mesas about Santa Fe, never extending into the mountains.

**Mentzelia parviflora** Heller, Bull. Torrey Club **25:** 199. 1898.

=*Acrolasia sp.*

"Eleven miles southeast of Santa Fe, on the road leading to Cañoncito," July 23, 1897, *A. A. Heller* 3750, at 2,200 meters.

**Mentzelia perennis** Wooton, Bull. Torrey Club **25:** 260. 1898.

=*Touterea perennis* (Wooton) Rydb.

"In a white soil (strongly impregnated with gypsum?) at Round Mountain, half way from Tularosa to the Mescalero Agency in the White Mountains," July 21, 1897, *E. O. Wooton* 184, at 1,630 meters.

## CACTACEAE.

**Cereus coccineus melanacanthus** Engelm. in A. Gray, Mem. Amer. Acad. II. **4:** 51. 1849.

=*Echinocereus coccineus* form.

"Santa Fe," *Fendler* in 1847.

**Cereus coccineus cylindricus** Engelm. in A. Gray, Mem. Amer. Acad. II. **4:** 51. 1849.

=*Echinocereus coccineus* form.

"Santa Fe," *Fendler* in 1847.

**Cereus fendleri** Engelm. in A. Gray, Mem. Amer. Acad. II. **4:** 51. 1849.

=*Echinocereus fendleri* (Engelm.) Rümpl.

"Santa Fe, on elevated sandy plains," June, 1847, *Fendler* 249.

Not infrequent upon the mesas about Santa Fe, the commonest of the Echinocerei in this locality.

**Cereus fendleri pauperculus** Engelm. in A. Gray, Mem. Amer. Acad. II. **4:** 51. 1849.

=*Echinocereus fendleri* form.

Type locality same as for the species.

**Cereus hexaedrus** Engelm. Proc. Amer. Acad. **3:** 285. 1856.

=*Echinocereus hexaedrus* (Engelm.) Rümpl.

"On sandy hills, under cedars, about 15 miles west of Zuni."

**Cereus phoeniceus conoideus** Engelm. Proc. Amer. Acad. **3:** 284. 1856.

=*Echinocereus conoideus* Engelm.

"Rocky places on the upper Pecos," probably at Anton Chico, for that is the locality given on the labels of what appear to be the type specimens, *Bigelow* in 1853.

**Cereus viridiflorus minor** Engelm. Proc. Amer. Acad. **3:** 278. 1856.

=*Echinocereus viridiflorus* form.

"About Santa Fe."

**Echinocactus horizonthalonius centrispinus** Engelm. Proc. Amer. Acad. **3:** 276. 1856.

=*Echinocactus horizonthalonius* Lem.

"Doñana," *Wislizenus* in 1846.

**Echinocactus wislizeni** Engelm. in Wisliz. Mem. North. Mex. 96. 1848.

"Near Doñana," *Wislizenus* in 1846.

Doctor Wislizenus says in his journal on August 5: "Before reaching Doñana I met on the road with the largest cactus of the kind I have ever seen. It was an oval Echinocactus with enormous fishhook-like prickles, measuring in height 4 feet and in the largest circumference 6 feet 8 inches. It had yellow flowers and at the same time seed, both of which I took along with some of the ribs." The discoverer was fortunate in seeing so large a specimen, for such size, in this locality at least, is unusual. The plant, in spite of the fact that it is extensively used by the Mexicans for making a kind of candy and for other purposes, is still common and one of the most conspicuous objects upon the sandy mesas about Dona Ana.

**Echinocereus coccineus** Engelm. in Wisliz. Mem. North. Mex. 93. 1848.

"With the foregoing (*E. triglochidiatus*), also about Santa Fe," *Wislizenus* in 1846.

There is no specimen from Wolf Creek in the Engelmann Herbarium, but there is one from Santa Fe, so the latter is perhaps to be considered the type. It is altogether possible, as has been suggested, that this is the same as the *Mamillaria aggregata* of Emory's Reconnoissance. *E. coccineus* is the only New Mexican Echinocereus, with one exception which need not enter into consideration, that forms dense hemispherical masses like the plant there illustrated.

**Echinocereus neomexicanus** Standley, Bull. Torrey Club **35:** 87. 1908.

"Mesa west of the Organ Mountains," *Standley* in 1907.

The type plants were cultivated but came originally from this locality.

**Echinocereus triglochidiatus** Engelm. in Wisliz. Mem. North. Mex. 93. 1848.

"On Wolf Creek, in pine woods," *Wislizenus* in 1846.

**Echinocereus viridiflorus** Engelm. in Wisliz. Mem. North. Mex. 91. 1848.

"Prairies on Wolf Creek," *Wislizenus* in 1846.

Collected on July 24, doubtless, since this stream was crossed on that day. This species is the type of the genus Echinocereus.

**Mamillaria aggregata** Engelm. in Emory, Mil. Recon. 155. *f. 1.* 1848.

This was sketched on October 18. On that day Emory was at Ben Moore and the Copper Mines, so the plant must have been found somewhere in that now classic locality. The species was described from a rather poor sketch, and it seems improbable that anyone will ever be able to determine what the sketch represents. Doctor Engelmann believed this to be *Echinocereus coccineus*, but it might possibly be one of the cespitose Mamillarias.

**Mamillaria macromeris** Engelm. in Wisliz. Mem. North. Mex. 97. 1848.

"Sandy soil near Doñana," *Wislizenus* in 1846.

No doubt collected upon the mesa near that settlement, for it is common there.

**Mamillaria papyracantha** Engelm. in A. Gray, Mem. Amer. Acad. II. **4:** 49. 1849.
=*Echinocactus papyracanthus* Engelm.

"In a valley between the lower hills, near Santa Fe, in loose, red sandy, though fertile soil, found only once," May, 1847, *Fendler* 245.

**Mamillaria vivipara radiosa borealis** Engelm. Proc. Amer. Acad. **3:** 269. 1856.
=*Mamillaria radiosa* Engelm.

"Northern New Mexico."

**Mamillaria vivipara radiosa neomexicana** Engelm. Proc. Amer. Acad. **3:** 269. 1856.

"From western Texas to New Mexico."

The New Mexican plant must have been intended as the type, else the varietal name would not have been assigned it.

**Mamillaria wrightii** Engelm. Proc. Amer. Acad. **3:** 262. 1856.

"Near the copper mines," *Wright* in 1851.

**Opuntia angustata** Engelm. Proc. Amer. Acad. **3:** 292. 1856.

"Foot of the Inscription Rock near Zuñi," *Bigelow* in 1853.

**Opuntia arborescens** Engelm. in Wisliz. Mem. North Mex. 90. 1848.

"Mountains of New Mexico," *Wislizenus* in 1846.

Doctor Engelmann in his description speaks of the specimens from Wagon Mound, which are probably to be taken as the type. In his journal on June 23 Doctor Wislizenus says: "* * * the so-called Wagon Mound * * * I ascended as far as the rocks would allow. On the Wagon Mound I found for the first time a specimen of the *Opuntia arborescens* (Eng.), so common throughout New Mexico, and whose porous stems are used in the South as torches." This cane cactus, as it is commonly called, though sometimes *velas de coyote*, is prominent everywhere on the plains in this part of New Mexico.

**Opuntia brachyarthra** Engelm. Proc. Amer. Acad. **3:** 302. 1856.

"At the foot of the Inscription Rock near Zuñi, under pine trees," *Bigelow* in 1853.

**Opuntia clavata** Engelm. in Wisliz. Mem. North. Mex. 95. 1848.

"About Albuquerque," *Wislizenus* in 1846, on the plains east of the city, no doubt, for the plant is most abundant there.

**Opuntia cymochila montana** Engelm. Proc. Amer. Acad. **3:** 296. 1856.

"On the Sandia Mountains, near Albuquerque," *Bigelow* in 1853.

**Opuntia davisii** Engelm. & Bigel. Proc. Amer. Acad. **3:** 305. 1856.

"On the Upper Canadian, eastward and westward of the Tucumcari hills," *Bigelow* in 1853.

If this was described from plants collected to the westward of the Tucumcari hills, it certainly has its type locality in New Mexico. If it came from the eastward, it may have come from New Mexico or from the Panhandle of Texas. The specific name was given in honor of Col. Jefferson Davis, then Secretary of War.

**Opuntia dillei** Griffiths, Rep. Mo. Bot. Gard. **20:** 82. *pl. 4. lower f., pl. 2. f. 10, pl. 13. f. 7.* 1909.

"San Andreas Canyon of the Sacramento Mountains," *David Griffiths* 9460, in 1908.

**Opuntia engelmanni cyclodes** Engelm. Proc. Amer. Acad. **3:** 291. 1856.

"About the mouth of the Gallinas into the Pecos, near Anton Chico," *Bigelow* in 1853.

No one since Bigelow has visited this locality in search of plants.

**Opuntia filipendula** Engelm. Proc. Amer. Acad. **3**: 294. 1856.

"Alluvial bottoms of the Rio Grande, near El Paso."

In the Cactaceae of the Mexican Boundary the locality is given as "alluvial bottoms of the Rio Grande near Dona Ana." The specimens in the Engelmann Herbarium, which appear to be the type, also bear this latter locality written upon their labels, so that the type locality is probably to be considered New Mexican. This Opuntia is common near Dona Ana, growing in the adobe soil of the Rio Grande Valley and in the loamy soil at the edge of the mesa, seldom or never occurring upon the sandy mesa.

**Opuntia hystricina** Engelm. & Bigel. Proc. Amer. Acad. **3**: 299. 1856.

"West of the Rio Grande to the San Francisco Mountains," *Bigelow*.

In what was intended to be the original publication of this species on page 44 of the Botany of Whipple's Report, we find the statement: "Abundant from the Rio Grande westward to the San Francisco Mountains," so that, in all probability, the type was gotten in New Mexico. The San Francisco Mountains are in Arizona.

**Opuntia microcarpa** Engelm. in Emory, Mil. Recon. 157. *f.* 7. 1848.

"Very abundant on the Del Norte and Gila," *Emory* in 1847.

This is another of the cacti that Doctor Engelmann described from Stanly's drawings and one regarding whose identification there must always be uncertainty. In his description Doctor Engelmann writes as follows: "Joints $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long and little less wide; berries obovate, scarlet, only about 3 or 4 inches long. If the figure represents the natural size, this species ought to bear the name *O. microcarpa.*" There is evidently some mistake in the statements about the proportions of the drawing. Of course it was less than natural size, and this explains the small size of the joints; but Doctor Engelmann must have made a slip of the pen in giving the relative dimensions of the fruit. Probably the description was intended to read "3 or 4 lines long." The drawing, the writer feels sure, represents the plant from southern New Mexico that has passed as *O. engelmanni cyclodes*, for no other species of the region has the habit shown in the figure. *Opuntia engelmanni cyclodes*, too, is common in the region described. It is true that its fruits are not scarlet, but I am not acquainted with any Opuntia of this type that has scarlet fruits, and there might easily have been a mistake in the shade of red assigned to the fruit.

**Opuntia missouriensis trichophora** Engelm. Proc. Amer. Acad. **3**: 300. 1856.

=*O. trichophora* (Engelm.) Britton & Rose.

"On the mountains near Albuquerque," *Bigelow* in 1853.

**Opuntia phaeacantha** Engelm. in A. Gray, Mem. Amer. Acad. II. **4**: 52. 1849.

"On rocky hills about Santa Fe and on the Rio Grande," *Fendler* 250, in May and June, 1847.

The plant might have been collected almost anywhere about Santa Fe, for it is everywhere common, both upon the mesa and in the foothills.

**Opuntia phaeacantha major** Engelm. Proc. Amer. Acad. **3**: 293. 1856.

"In mountainous regions near Santa Fe."

**Opuntia sphaerocarpa** Engelm. Proc. Amer. Acad. **3**: 300. 1856.

"On the eastern declivity of the Sandia Mountains near Albuquerque," *Bigelow* in 1853.

Apparently this plant has not been collected since.

**Opuntia stanlyi** Engelm. in Emory, Mil. Recon. 157. *f.* 9. 1848.

This was collected by Emory on October 22. On this date he traveled along the Gila just on the present line between New Mexico and Arizona, so the plant may have been collected in either Territory. Doctor Engelmann says, quoting from the collector's notes: "Abundant on the Del Norte and Gila." The former of these localities must be wrong, for what is taken to be this plant, the only Opuntia of the type

found in New Mexico, has been found in the Territory only along the Gila. It is certainly not abundant along the Rio Grande. The specific name was given in honor of Mr. J. M. Stanly, who was the artist of the expedition and made the drawing upon which the description was based. *Opuntia emoryi* is probably a synonym of this species.

**Opuntia stenochila** Engelm. Proc. Amer. Acad. **3**: 296. 1856
"Zuni, western New Mexico," *Bigelow* in 1853.

**Opuntia whipplei** Engelm. Proc. Amer. Acad. **3**: 307. 1856.
"Elevated country about Zuni," *Bigelow* in 1853.

## ONAGRACEAE.

**Anogra neomexicana** Small, Bull. Torrey Club **23**: 176. 1896.
"Sandy bed of a creek near the copper mines," *Wright* 1068 in 1851.

**Epilobium fendleri** Hausskn. Monogr. Epilob. 261. 1884.
"New Mexico," *Fendler* 217 of 1847, in part.

**Epilobium novomexicanum** Hausskn. Monogr. Epilob. 260. 1884.
"In Novo-Mexico ad Santa Fe," *Fendler* 217 of 1847, in part.

**Gaura neomexicana** Wooton, Bull. Torrey Club **25**: 307. 1898.
"On the South Fork of Tularosa Creek 3 miles east of the Mescalero Agency in the White Mountains," July 25, 1897, *E. O. Wooton*, at 2,000 meters.

**Oenothera albicaulis gypsophila** Eastwood, Proc. Calif. Acad. III. **1**: 73. 1897.
=*Anogra* sp.
White Sands, *T. D. A. Cockerell.*

**Oenothera albicaulis runcinata** Engelm. Amer. Journ. Sci. II. **34**: 334. 1862.
=*Anogra* sp.
"Near Santa Fe," *Fendler* in 1847.

**Oenothera eximia** A. Gray, Mem. Amer. Acad. II. **4**: 45. 1849.
"Along Santa Fe Creek," June, July, 1847, *Fendler* 228.

**Oenothera fendleri** A. Gray, Mem. Amer. Acad. II. **4**: 45. 1849.
=*Galpinsia fendleri* (A. Gray) Heller.
"Sunny hillsides at Santa Fe, and on the Rio del Norte," May to August, 1847, *Fendler* 230.

**Oenothera pinnatifida integrifolia** A. Gray, Mem. Amer. Acad. II. **4**: 44. 1849.
=*Anogra* sp.
"Santa Fe, and along the Cimarron, in gravelly soil or sand," June to August, 1847, *Fendler* 224.

**Oenothera tubicula filifolia** Eastwood, Proc. Calif. Acad. II. **1**: 72. 1897.
White Sands, *T. D. A. Cockerell.*

**Oenothera wrightii** A. Gray, Smiths. Contr. Knowl. **5**: 57. 1853.
=*Lavauxia wrightii* (A. Gray) Small.
"Stony hills, near the copper mines," *Wright* 1072 in 1851.

## APIACEAE.

**Archemora fendleri** A. Gray, Mem. Amer. Acad. II. **4**: 56. 1849.
=*Oxypolis fendleri* (A. Gray) Heller.
"Margins of Santa Fe Creek, in fertile soil," June and July, 1847, *Fendler* 272.
Probably the commonest umbellifer in the Santa Fe Mountains, everywhere in wet places, especially along the edges of streams.

**Cymopterus fendleri** A. Gray, Mem. Amer. Acad. II. **4:** 56. 1849.
"Gravelly hills, Santa Fe," April, May, 1847, *Fendler* 274.

**Cymopterus purpureus** S. Wats. Amer. Nat. **7:** 4. 1873.
=*Aulospermum purpureum* (S. Wats.) Coulter & Rose.
"New Mexico," *Dr. Edward Palmer* in 1869.

**Deweya? acaulis** Torr. Pac. R. Rep. **4:** 94. 1856.
=*Aletes acaulis* (Torr.) Coulter & Rose.
"In crevices of rocks near Santa Antonita," October, 1853, *Bigelow.*

**Eryngium sparganophyllum** Hemsl. Hook. Icon. Pl. **6:** *pl. 2508.* 1897.
"Las Playas Springs, near the Sierra de los Animos," *Wright* 1103 in 1851.
This should be corrected to Sierra de las Animas.

**Ligusticum scopulorum** A. Gray, Proc. Amer. Acad. **7:** 347. 1867.
=*Conioselinum scopulorum* (A. Gray) Coulter & Rose.
"Santa Antonita," October, 1853, *Bigelow.*

**Pseudocymopterus montanus multifidus** Rydb. Bull. Torrey Club **31:** 574. 1904.
"Range between Sapello and Pecos Rivers," *T. D. A. Cockerell* in 1900.

**Thaspium? montanum** A. Gray, Mem. Amer. Acad. II. **4:** 57. 1849.
=*Pseudocymopterus montanus* (A. Gray) Coulter & Rose.
"Sunny declivities at the foot of mountains, along Santa Fe Creek," April to July, 1847, *Fendler* 276.
One of the commonest plants in the Santa Fe range, from near the base of the mountains almost to their summits, on open or thinly forested hillsides.

## PRIMULACEAE.

**Androsace glandulosa** Wooton & Standley, Bull. Torrey Club **34:** 519. 1907.
"On the Middle Fork of the Rio Gila, August 5, 1900, at an altitude of about 2,100 meters, by E. O. Wooton."

**Androsace platysepala** Wooton & Standley, Bull. Torrey Club **34:** 519. 1907.
"At Kingston, Sierra County, New Mexico, on open hills, March 30, 1905, *O. B. Metcalfe,*" no. 1547.

**Dodecatheon radicatum** Greene, Erythea **3:** 37. 1895.
"Near Santa Fe," *Fendler* 549 in 1847.
This must have come from the mountains east of Santa Fe, probably along Santa Fe Creek, where the plant is common, at altitudes of about 2,400 to almost 3,600 meters.

**Primula angustifolia helenae** Pollard & Cockerell, Proc. Biol. Soc. Washington **15:** 179. 1902.
"Las Vegas Moutnains," *Miss Helen Blake.*

**Primula ellisiae** Pollard & Cockerell, Proc. Biol. Soc. Washington **15:** 178. 1902.
"Sandia Mountains," *Miss Charlotte Ellis.*

**Primula rusbyi** Greene, Bull. Torrey Club **8:** 122. 1881.
"On rich moist slopes, near the summits of the Mogollon Mountains," *H. H. Rusby* in August, 1881.

## OLEACEAE.

**Forestiera neomexicana** A. Gray, Proc. Amer. Acad. **12:** 63. 1876.
=*Adelia neomexicana* (A. Gray) Kuntze.
"New Mexico," *Fendler* in 1847.

**Fraxinus velutina** Torr. in Emory, Mil. Recon. 149. 1848.
"Between the waters of the Del Norte and the Gila," *Emory* in 1847.
Emory speaks of having seen this tree first on October 15, the day on which he turned west from the valley of the Rio Grande just below Fray Cristobal.

## GENTIANACEAE.

**Amarella cobrensis** Greene, Leaflets **1:** 56. 1904.
"At Santa Rita del Cobre," October 11, 1880, *E. L. Greene.*

**Amarella revoluta** Greene, Leaflets **1:** 55. 1904.
"Southern New Mexico, in the White Mountains," *E. O. Wooton* 552 in 1897.

**Frasera paniculata** Torr. Pac. R. Rep. **4:** 126. 1856.
"Sand bluffs, Inscription Rock, Zuni country," *Bigelow* in 1853.

**Frasera venosa** Greene, Pittonia **4:** 185. 1900.
"On hills near Santa Rita del Cobre," *E. L. Greene* in 1880.

**Gentiana bigelovii** A. Gray, Proc. Amer. Acad. **19:** 87. 1883.
"In the Sandia Mountains," *Bigelow* in 1853.

**Gentiana rusbyi** Greene in A. Gray, Syn. Fl. **2**[1]**:** 406. 1886.
"Mogollon Mountains," *H. H. Rusby.*

## APOCYNACEAE.

**Apocynum laurinum** Greene, Pittonia **5:** 65. 1902.
"Organ Mountains," *E. O. Wooton* 113 in 1897.

## ASCLEPIADACEAE.

**Acerates auriculata** Engelm. in Torr. Bot. Mex. Bound. 160. 1859.
"Dry ravines near the copper mines, and along the Mimbres," June and July, *Bigelow.*

**Asclepias arenaria** Torr. Bot. Mex. Bound. 162. 1859.
"Sandy banks; Journado del Muerto, and on the upper Rio Gila," June and July.
This should be corrected to Jornada del Muerto.

**Asclepias involucrata** Engelm. in Torr. Bot. Mex. Bound. 163. 1859.
"Sandy soils, on the Mimbres and near the copper mines," April and May, *Bigelow, Thurber* (other localities mentioned).

**Asclepias nummularia** Torr. Bot. Mex. Bound. 163. *pl. 45.* 1859.
"Copper Mines," April, *Bigelow, Thurber* (other localities mentioned).

**Asclepias quinquedentata neomexicana** Greene, Proc. Amer. Acad. **16:** 103. 1880.
"Rocky mountain side east of Pinos Altos," June 22, 1880, *E. L. Greene.*

**Asclepias scaposa** Vail, Bull. Torrey Club **25:** 171. 1897.
"Near Santa Rita," *Wright* in 1851.

**Asclepias uncialis** Greene, Bot. Gaz. **5:** 64. 1880.
"Open hilltops in southwestern New Mexico, about Silver City," April, *E. L. Greene.*

**Asclepias verticillata leptophylla** Torr. in Sitgreaves, Rep. Zuni & Colo. 164. 1854.
"Rio Laguna," *Dr. S. W. Woodhouse* in August, 1852.

**Asclepias wrightii** Greene, Proc. Amer. Acad. **16:** 102. 1880.
"Near Santa Rita," *Wright* in 1851; "between Silver City and Lone Mountain," July 10, 1880, *E. L. Greene.*

## CONVOLVULACEAE.

**Evolvulus oreophilus** Greene, Leaflets **1**: 151. 1905.

"Dry hills west of Hillsboro, at 1,650 meters at base of Black Range," August, 1904, *O. B. Metcalfe* 1228.

## POLEMONIACEAE.

**Callisteris formosissima** Greene, Leaflets **1**: 160. 1905.

=*Batanthes formosissima* Greene.

"Black Range," *O. B. Metcalfe* 1318 in 1904.

**Collomia thurberi** A. Gray, Proc. Amer. Acad. **8**: 261. 1870.

"Near the Santa Rita copper mines," *Thurber.*

**Gilia bigelovii** A. Gray, Proc. Amer. Acad. **8**: 265. 1870.

A new name for *G. dichotoma parviflora.*

**Gilia dichotoma parviflora** Torr. Bot. Mex. Bound. 147. 1859.

"Cook's Spring, near Frontera, Tex.," March and April, *Bigelow, Wright* in 1851.

Cooks Spring is in New Mexico, while Fronteras is Texan.

**Gilia formosa** Greene in Brand, Pflanzenreich IV. **250**: 119. 1907.

"Nordliches New Mexico: Aztec," April, 1899, *C. F. Baker* 535.

**Gilia multiflora** Nutt. Journ. Acad. Phila. n. ser. **1**: 154. 1848.

"Sandy hills along the borders of the Rio del Norte," *William Gambel.*

**Gilia rigidula acerosa** A. Gray, Proc. Amer. Acad. **10**: 280. 1870.

"Northern New Mexico to Arizona," *Fendler* and other collectors.

**Phlox mesoleuca** Greene, Leaflets **1**: 152. 1905.

"Dry foothills of the Black Range, New Mexico, at 6,600 feet," June 29, 1904, *O. B. Metcalfe* 1272.

**Phlox nana** Nutt. Journ. Acad. Phila. n. ser. **1**: 153. 1848.

"Rocky Mountains near Santa Fe," *William Gambel.*

The species is abundant in the immediate vicinity of Santa Fe, on the lower foothills up to about 2,340 meters.

**Phlox nana glabella** A. Gray, Proc. Amer. Acad. **10**: 257. 1870.

"New Mexico (near Santa Fe, etc.)."

**Phlox speciosa stansburyi** Torr. Bot. Mex. Bound. 145. 1859.

=*Phlox stansburyi* (Torr.) Heller.

"Gravelly hills near the Organ Mountains," *Bigelow.*

Not uncommon on the Organ foothills, on dry open slopes, flowering in spring.

**Polemonium filicinum** Greene, Pittonia **1**: 124. 1887.

"Pinos Altos Mountains," October, 1880, *E. L. Greene.*

**Polemonium flavum** Greene, Bot. Gaz. **6**: 217. 1881.

"Cold northward slopes of the highest Pinos Altos Mountains," September 15, 1880, *E. L. Greene.*

**Polemonium pterospermum** Nelson & Cockerell, Proc. Biol. Soc. Washington **16**: 45. 1903.

"Cloudcroft, Sacramento Mountains (Canadian Zone)," September, 1900, *T. D. A. Cockerell.*

## HYDROPHYLLACEAE.

**Conanthus carnosus** Wooton, Bull. Torrey Club **25**: 262. 1898.
"White Sands," July 17, 1897, at 1,200 meters, *E. O. Wooton* 164.
Abundant about the edge of the sands, not on the dunes but in soil at their base.

**Hydrophyllum occidentale fendleri** A. Gray, Proc. Amer. Acad. **10**: 314. 1875.
=*Hydrophyllum fendleri* (A. Gray) Heller.
"Colorado, New Mexico."
Evidently based upon Fendler's specimens, collected in 1847 near Santa Fe. The plant is found everywhere in damp, shaded places in the Santa Fe Mountains, most commonly in bogs and along the edges of streams, flowering in June and July.

**Phacelia caerulea** Greene, Bull. Torrey Club **8**: 122. 1881.
"Southern New Mexico and Arizona," *E. L. Greene*.

**Phacelia intermedia** Wooton, Bull. Torrey Club **25**: 457. 1898.
"On the mesa near Las Cruces," April 10, 1893, *E. O. Wooton*.
One of the most abundant spring flowers in this locality, occurring sometimes in the Rio Grande Valley, and on the Organ foothills. *P. caerulea* is found in the same locality and flowers at the same time.

**Phacelia neomexicana** Thurber; Torr. Bot. Mex. Bound. 143. 1859.
"Pine woods near the copper mines," August, *Thurber;* and *Wright* 1577 in 1851.

**Phacelia popei** Torr. & Gray, Pac. R. Rep. **2**: 172. *pl. 10*. 1855.
"On the Llano Estacado and Pecos," March, April, 1854, *Pope*.
It is barely possible that this was collected in New Mexico, but it is more probable that it was found in Texas.

**Phacelia rupestris** Greene, Leaflets **1**: 152. 1905.
"Crevices of rocks, foothills of the Black Range," June 25, 1904, *O. B. Metcalfe* 1012.

**Phacelia similis** Wooton & Standley, Bull. Torrey Club **36**: 111. 1909.
"On the plains near Nutt Station, Sierra County," May 12, 1905, *O. B. Metcalfe* 1665.

## HELIOTROPACEAE.

**Euploca grandiflora** Torr. in Emory, Mil. Recon. 147. 1848.
=*Euploca convolvulacea* Nutt.
"On the del Norte below Santa Fe," *Emory* in 1847.

**Heliotropium xerophilum** Cockerell, Bot. Gaz. **33**: 379. 1902.
"Albuquerque," December 3, 1901, *T. D. A. Cockerell*.

## BORAGINACEAE.

**Cryptanthe dicarpa** A. Nelson, Proc. Biol. Soc. Washington **16**: 30. 1903.
"Mesilla Park," *T. D. A. Cockerell*.

**Echinospermum pinetorum** Greene, Proc. Amer. Acad. **17**: 224. 1882.
=*Lappula pinetorum* Greene.
"On the Pinos Altos Mountains," July and September, 1880, *E. L. Greene*.

**Echinospermum ursinum** Greene, Proc. Amer. Acad. **17**: 224. 1882.
=*Lappula ursina* Greene.
"On gravel beds of Bear Canyon in the Bear Mountains," *E. L. Greene* in 1880.

**Eritrichium glomeratum hispidissimum** Torr. Bot. Mex. Bound. 140. 1859.
=*Oreocarya hispidissima* (Torr.) Rydb.
"Common in New Mexico."

**Krynitzkia fendleri** A. Gray, Proc. Amer. Acad. **20:** 268. 1885.
=*Cryptanthe fendleri* (A. Gray) Greene.
"New Mexico," *Fendler* in 1847. (Other localities mentioned.)
Frequent upon the sandy mesas about Santa Fe, where Fendler first collected it.

**Lappula leucantha** Greene, Leaflets **1:** 152. 1905.
"Shady canyon of Iron Creek, Black Range," October 11, 1904, *O. B. Metcalfe* 1475.

**Lithospermum cobrense** Greene, Bot. Gaz. **6:** 157. 1881.
"Santa Rita del Cobre," *Wright, E. L. Greene.*

**Lithospermum oblongum** Greene, Pittonia **4:** 92. 1899.
"Hills about Aztec, northern New Mexico, growing among nut pines and cedars," April 26, 1899, *C. F. Baker.*

**Lithospermum viride** Greene, Bot. Gaz. **6:** 158. 1881.
"In the Mimbres Mountains, near Georgetown," 1877; and "on Swan Mountain, near Silver City, 1880," *E. L. Greene.*

**Mertensia caelestina** Nelson & Cockerell, Proc. Biol. Soc. Washington **16:** 46. 1903.
"Truchas Peaks, above timber line (Arctic-Alpine Zone)," 1902, *Wilmatte P. Cockerell* 40.

**Mertensia pratensis** Heller, Bull. Torrey Club **26:** 550. 1899.
"In a meadow in Santa Fe Canyon, 9 miles east of Santa Fe," June 2, 1897, *A. A. Heller* 3641.

**Onosmodium thurberi** A. Gray, Syn. Fl. **2**[1]**:** 205. 1886.
"New Mexico," *Thurber* (other localities mentioned).
Probably collected by Thurber at Santa Rita.

**Oreocarya lutescens** Greene, Pittonia **4:** 93. 1899.
"Common on hills about Aztec," April 25, 1899, *C. F. Baker.*

## VERBENACEAE.

**Verbena canescens neomexicana** A. Gray, Syn. Fl. **2**[1]**:** 337. 1886.
"Borders of thickets near the copper mines," *Wright* in 1851, *Bigelow.*

**Verbena confinis** Greene, Pittonia **4:** 152. 1900.
"Organ Mountains," August 30, 1897, *E. O. Wooton* 409.
In the Organ foothills on dry, rocky slopes, and in the Rio Grande Valley.

**Verbena officinalis hirsuta** Torr. Bot. Mex. Bound. 128. 1859.
=*Verbena canescens neomexicana* A. Gray.
"Near the copper mines."

**Verbena perennis** Wooton, Bull. Torrey Club **25:** 263. 1898.
"Growing in crevices of rocks along the road about 2 miles west of the Mescalero Agency, in the White Mountains," July 21, 1897, at 1,800 meters, *E. O. Wooton* 187.

## MENTHACEAE.

**Brittonastrum greenei** Briquet, Ann. Cons. Jard. Genève **6:** 157. 1902.
"Nouveau Mexique: Chama," September 3, 1899, *C. F. Baker* 567.
According to Dr. P. A. Rydberg this is a synonym of *Agastache pallidiflora* (Heller) Rydb.

**Brittonastrum neomexicanum** Briquet, Ann. Cons. Jard. Genève **6:** 158. 1902.
=*Agastache neomexicana* (Briq.)
"White Mountains, Lincoln County," August 1, 1897, *E. O. Wooton* 266.
Collected at the summit of the divide 9 miles northeast of the Mescalero Agency.

**Cedronella cana lanceolata** A. Gray, Syn. Fl. **2**[1]: 462. 1886.
=*Agastache lanceolata* (A. Gray).
"Mountains of New Mexico," *Wright, G. R. Vasey, H. H. Rusby.*

**Cedronella rupestris** Greene, Pittonia **1:** 164. 1888.
=*Agastache rupestris* (Greene).
"Mangas Springs, near Silver City," *E. L. Greene* in 1880.

**Hedeoma ciliata** Nutt. Journ. Acad. Phila. n. ser. **1:** 183. 1848.
"Santa Fe," *William Gambel.*

**Hedeoma piperita oblongifolia** A. Gray, Proc. Amer. Acad. **8:** 366. 1872.
"New Mexico and Arizona."

**Hedeoma pulchella** Greene, Leaflets **1:** 213. 1906.
"Limestone hills at about 6,600 feet near Kingston," May 18, 1905, *O. B. Metcalfe* 1599.

**Monarda pectinata** Nutt. Journ. Acad. Phila. n. ser. **1:** 182. 1848.
"Near Santa Fe," *William Gambel.*
Occasional on the sandy mesas and in the lower foothills about Santa Fe.

**Monarda punctata humilis** Torr. in Sitgreaves, Rep. Zuni & Colo. 166. 1854.
"On the Zuni," September, 1852, *Dr. S. W. Woodhouse.*

**Monarda stricta** Wooton, Bull. Torrey Club **25:** 263. 1898.
"On the divide 9 miles northeast of the Mescalero Agency in the White Mountains," August 1, 1897, at 2,100 meters, *E. O. Wooton* 267.

**Salvia henryi** A. Gray, Proc. Amer. Acad. **8:** 368. 1872.
"On the Mimbres," *Doctor Henry.*

**Stachys rothrockii** A. Gray, Proc. Amer. Acad. **12:** 82. 1876.
"Zuni Village," *J. T. Rothrock* in 1874.

## SOLANACEAE.

**Margaranthus purpurascens** Rydb. Mem. Torrey Club **4:** 317. 1896.
"New Mexico," *H. H. Rusby* 307 in 1881.

**Physalis fendleri** A. Gray, Proc. Amer. Acad. **10:** 66. 1874.
"Rocks and plains of New Mexico," *Fendler* 683 in 1847; and *Wright* 1599 in 1851.

**Physalis neomexicana** Rydb. Mem. Torrey Club **4:** 325. 1896.
"New Mexico," *Fendler* 679 in 1847.
Collected about Santa Fe, probably. Common in moist places, especially frequent in cultivated land.

**Solanum fendleri** A. Gray, Amer. Journ. Sci. II. **22:** 285. 1856.
"In the northern part of New Mexico," *Fendler* in 1847 (other localities mentioned).

**Solanum tuberosum boreale** A. Gray, Syn. Fl. **2**[1]: 227. 1886.
A new name for *Solanum fendleri.*

## SCROPHULARIACEAE.

**Castilleja affinis minor** A. Gray in Torr. Bot. Mex. Bound. 119. 1859.
=*Castilleja minor* A. Gray.
"Beds of exsiccated streams, near the Copper Mines," *Bigelow, Wright* 1494 in 1851.

**Castilleja confusa** × **acuminata** Cockerell, Bot. Gaz. **29:** 280. 1900.
"Harvey's Ranch near Las Vegas," *T. D. A. Cockerell.*

**Castilleja inconstans** Standley, Muhlenbergia **5**: 83. 1909.

"At Winsor's Ranch, on the headwaters of the Pecos River," June 29, 1908, *Standley* 4000.

**Castilleja integra** A. Gray in Torr. Bot. Mex. Bound. 119. 1859.

"Organ Mountains, east of El Paso," *Wright* (undistributed), *Bigelow*.

One of the commonest species of the southwest. It is very abundant in the type locality at the lower levels. It is altogether possible that what Doctor Gray referred to as the Organ Mountains are those now known as the Franklin Mountains, for the Organ range proper is not "east of El Paso," but north, and the Franklin and San Andreas ranges, the one lying to the south and the other to the north of the Organs, were not given separate names at that time.

**Castilleja integra intermedia** Cockerell, The Southwest, Cooper **2**: 134. 1900.

"Near Rowe," *T. D. A. Cockerell*.

**Castilleja organorum** Standley, Muhlenbergia **5**: 86. 1909.

"On the rocky sides of the Organ Mountains not far from Van Patten's Camp," June 9, 1906, *Standley*.

**Castilleja wootonii** Standley, Muhlenbergia **5**: 84. 1909.

"At Gilmore's Ranch on Eagle Creek in the White Mountains," August 25, 1907, *Wooton & Standley* 3411.

**Conobea intermedia** A. Gray in Torr. Bot. Mex. Bound. 117. 1859.

"Dry hills around the Copper Mines," *Wright* 1485 in 1851.

**Maurandia wislizeni** A. Gray in Torr. Bot. Mex. Bound. 111. 1859.

"Along the Rio Grande below Dona Ana," *Wislizenus* in 1846.

This handsome vine is common in sandy soil in the Rio Grande Valley in this locality.

**Mimulus cordatus** Greene, Leaflets **2**: 5. 1909.

"Bear Mountain, near Silver City," *O. B. Metcalfe* in 1903.

**Mimulus rubellus** A. Gray in Torr. Bot. Mex. Bound. 116. 1859.

"Wet ravines of the Organ Mountains and Copper Mines," *Bigelow, Wright* 1494 in 1851.

In the Organ Mountains this is a not infrequent plant, occurring chiefly in wet places in the bottoms of the canyons, but also on drier open slopes; flowering in early spring.

**Pedicularis angustissima** Greene, Leaflets **1**: 151. 1905.

"Mogollon Mountains," August 14, 1903, *O. B. Metcalfe* 496.

**Pedicularis centranthera** A. Gray in Torr. Bot. Mex. Bound. 120. 1859.

"New Mexico, and on Ben More," April, *Bigelow*.

Why the locality should be stated thus I do not know, for Ben Moore is in New Mexico.

**Pedicularis fluviatilis** Heller, Minn. Bot. Stud. **2**: 33. 1898.

"In a meadow 9 miles east of Santa Fe," *Heller* 3639 in 1897.

A plant very common in the mountains east of Santa Fe, very close to *P. canadensis* and hardly separable from that species.

**Pedicularis mogollonica** Greene, Leaflets **1**: 151. 1905.

"Mogollon Mountains," August 14, 1903, *O. B. Metcalfe* 496.

**Pentstemon caudatus** Heller, Minn. Bot. Stud. **2**: 34. 1898.

"Barranca, Taos County," *Heller* 3580 in 1897.

This is considered a variety of *P. angustifolius* Pursh by Dr. Louis Krautter in his paper, "A Comparative Study of the genus Pentstemon."

**Pentstemon dasyphyllus** A. Gray in Torr. Bot. Mex. Bound. 112. 1859.

"Stony hills of the Pecos, and Cook's Spring," *Wright* 1478.

The first of these localities is in Texas, the second in New Mexico. From Doctor Gray's statement I take it that both collections were distributed under the same number in spite of the fact that the two localities are more than 150 miles apart, such being a common practice of his.

**Pentstemon fendleri** Torr. & Gray, Pac. R. Rep. **2**: 168. *pl. 5.* 1855.

"On the Pecos and Llano Estacado," *Pope* in March and April of 1854.

If Pope's collection is the type the plant probably came from Texas; there is a bare possibility that it was collected in New Mexico. Doctor Gray in the Synoptical Flora considered this a synonym of *P. acuminatus* Dougl. Doctor Krautter gives it as a synonym of *P. nitidus* Dougl. It is probably distinct from both.

**Pentstemon linarioides** A. Gray in Torr. Bot. Mex. Bound. 112. 1859.

"Organ Mountains," *Parry;* also "Copper Mines and Las Animas," *Wright* 1472; *Thurber* 331, 1115.

Not infrequent in the Organ Mountains at the lower elevations, flowering in spring and early summer.

**Pentstemon metcalfei** Wooton & Standley, Torreya **9**: 145. 1909.

A new name for *P. puberulus* Wooton & Standley.

**Pentstemon pauciflorus** Greene, Bot. Gaz. **6**: 218. 1881.

"On a bluff of the Gila River, in the extreme southwestern part of New Mexico near the border of Arizona," August 30, 1880, *E. L. Greene.*

Doctor Krautter places this as a synonym of *P. lanceolatus* Benth. The statement that the type locality is in "the extreme southwestern part of New Mexico" is hardly correct, for the Gila flows from New Mexico into Arizona about 100 miles from the southwestern corner of New Mexico.

**Pentstemon puberulus** Wooton & Standley, Bull. Torrey Club **36**: 112. 1909.

=*Pentstemon metcalfei* Wooton & Standley.

"On shady slopes at the Lookout Mine, Sierra County," May 2, 1905, *O. B. Metcalfe* 1605.

**Pentstemon thurberi** Torr. Pac. R. Rep. **7**[3]: 15. 1857.

=*Leiostemon thurberi* (A. Gray) Greene.

"Burro Mountains," August, 1854, *Dr. Thomas Antisell.*

This seems to be the type locality; but Thurber's plants were collected in Sonora. Doctor Greene, very properly it seems to the writer, makes this the type of a new genus, for the group of plants to which it belongs is very different from true Pentstemon. This species has been considered by some a subspecies of *P. ambiguus* Torr.

**Pentstemon virgatus** A. Gray in Torr. Bot. Mex. Bound. 113. 1859.

"Santa Rita del Cobre, on the mountains," *Bigelow, Wright* 1476 in 1851.

**Pentstemon whippleanus** A. Gray, Proc. Amer. Acad. **6**: 73. 1862.

"Arroyas in the Sandia Mountains," *Bigelow* in 1853.

**Scrophularia coccinea** A. Gray in Torr. Bot. Mex. Bound. 111. 1856.

"At the base of a rocky ledge near the summit of a mountain, Santa Rita del Cobre," *Wright* 1470 in 1851.

A very rare plant, collected only once since 1851, apparently, by Mr. O. B. Metcalfe in this same region in 1904. His collection was distributed as a new species under Doctor Greene's approval, but the latter has never published the description of the new species.

**Scrophularia montana** Wooton, Bull. Torrey Club **25**: 308. 1898.

"On Eagle Creek near Gilmore's Ranch in the White Mountains," August 5, 1897, altitude 2,100 meters, *E. O. Wooton* 280.

Common in the White Mountains and in some of the other ranges of southern New Mexico. Collected several times since 1897 in the type locality.

## OROBANCHACEAE.

**Orobanche multiflora** Nutt. Journ. Acad. Phila. n. ser. **1**: 179. 1848.

= *Myzorrhiza multiflora* (Nutt.) Rydb.

"Sandy ground along the borders of the Rio del Norte," September, *William Gambel.*

**Orobanche xanthochroa** A. Nelson & Cockerell, Bot. Gaz. **37**: 278. 1904.

"Pecos," "parasitic on roots of Quercus," June 7, 1903, *Dr. M. Grabham.*

## MARTYNIACEAE.

**Martynia parviflora** Wooton, Bull. Torrey Club **25**: 453. 1898.

"At San Augustine Ranch at the base of the Organ Mountains," August 30, 1897, *E. O. Wocton* 580, altitude 1,350 meters (other localities and collections mentioned).

This ranch is on the east side of the Organ Mountains just south of Organ Pass.

## RUBIACEAE.

**Galium acutissimum** A. Gray, Proc. Amer. Acad. **7**: 350. 1867.

"Between the Rio del Norte and New Mexico," *Newberry.*

Just what locality is thus described it is impossible to state. It is probable that the plant was collected about the northern edge of the Territory.

**Galium asperrimum** A. Gray, Mem. Amer. Acad. II. **4**: 60. 1849.

"Wet places near irrigating ditches, Santa Fe," June, 1847, *Fendler* 289.

**Galium brandegei** A. Gray, Proc. Amer. Acad. **12**: 58. 1876.

"Valley of the Rio Grande, New Mexico, on the Los Pinos trail," at 2,700 meters, September, 1875, *T. S. Brandegee.*

What and where the Los Pinos trail may be I do not know; very possibly it is not in New Mexico.

**Galium fendleri** A. Gray, Mem. Amer. Acad. II. **4**: 60. 1849.

"Sunny side of high mountains, valley of Santa Fe Creek," July 1847, *Fendler* 288.

**Oldenlandia greenei** A. Gray, Proc. Amer. Acad. **19**: 77. 1883.

"Pinos Altos Mountains," *E. L. Greene* 149 in 1880.

## CAPRIFOLIACEAE.

**Sambucus melanocarpa** A. Gray, Proc. Amer. Acad. **19**: 76. 1883.

"First collected in New Mexico," *Fendler* in 1847 (other localities and collectors mentioned).

Probably collected by Fendler around Santa Fe. What appears to be this species grows along Santa Fe Creek just above the town.

**Sambucus neomexicana** Wooton, Bull. Torr. Club **25**: 309. 1898.

"At Ruidoso Crossing in the White Mountains," August 2, 19, 1897, *E. O. Wooton* 648.

**Symphoricarpos rotundifolius** A. Gray, Smiths. Contr. Knowl. **5**: 66. 1853.

"Sides of mountains around the copper mines," *Wright* 1388 in 1851.

## CUCURBITACEAE.

**Cucurbita digitata** A. Gray, Smiths. Contr. Knowl. **5:** 60. 1853.

"Prairies, in loose, sandy soil, between the copper mines and Conde's Camp," *Wright* 1088 in 1851.

Apparently rare, but occasionally collected since.

**Echinopepon confusus** Rose, Contr. Nat. Herb. **5:** 116. 1897.

"Pinos Altos Mountains," September 16, 1890, *E. L. Greene.*

**Megarrhiza gilensis** Greene, Bull. Torrey Club **8:** 97. 1881.

= *Micrampelis gilensis* (Greene) Britton.

"In deep sand on the banks of the upper Gila River and its tributaries, climbing high over willows, flowering in February and March," *E. L. Greene.*

**Sicyos ampelophyllus** Wooton & Standley, Bull. Torrey Club **36:** 111. 1909.

"At Kingston, Sierra County," "in cultivated ground," August 5, 1904, *O. B. Metcalfe* 1195, altitude 2,030 meters.

**Sicyos glaber** Wooton, Bull. Torrey Club **25:** 310. 1898.

"In the Organ Mountains south of San Augustine Ranch," September 1, 1897, *E. O. Wooton* 606, altitude 1,500 meters.

The type locality is on the east side of the range, but this plant is common throughout the Organs, in the damper parts of the canyons.

## AMBROSIACEAE.

**Franseria tenuifolia** A. Gray, Mem. Amer. Acad. II. **4:** 80. 1849.

=*Gaertneria tenuifolia* (A. Gray) Kuntze.

"Poñi Creek, between Bent's Fort and Santa Fe; also at Santa Fe," July to October, 1847, *Fendler* 406.

Bent's Fort was on the Arkansas in Colorado.

**Xanthium commune wootoni** Cockerell, Proc. Biol. Soc. Washington **16:** 9. 1903.

"At Española, N. M., and Las Vegas, N. M.," *T. D. A. Cockerell.*

This is but a variant of *X. commune*, for Professor Cockerell reports that he later found the fruit of the typical form and the fruit of subspecies *wootoni* on the same plant.

## ASTERACEAE.

**Achillea laxiflora** Pollard & Cockerell, Proc. Biol. Soc. Washington **15:** 179. 1902.

"In the Sandia Mountains," altitude 2,400 meters, *Miss Charlotte Ellis.*

**Actinella argentea** A. Gray, Mem. Amer. Acad. II. **4:** 100. 1849.

= *Tetraneuris argentea* (A. Gray) Greene.

"Gravelly and stony hills around Santa Fe," April to June, 1847, *Fendler* 457.

Abundant in the type locality.

**Actinella bigelovii** A. Gray, Smiths. Contr. Knowl. **5:** 96. 1853.

= *Macdougalia bigelovii* (A. Gray) Heller.

"On mountains near the copper mines," *Bigelow.*

**Actinella depressa pygmaea** Torr. & Gray, in A. Gray, Mem. Amer. Acad. II. **4:** 100. 1849.

= *Tetraneuris* sp.

"Raton Mountains," April, 1848, *A. Gordon.*

The Raton Mountains are on the boundary between Colorado and New Mexico, and this plant may have been collected in either.

**Actinella leptoclada** A. Gray, Pac. R. Rep. **4:** 107. 1856.
=*Tetraneuris leptoclada* (A. Gray) Greene.
"In mountains and rocky places near Santa Antonita," October, 1853, *Bigelow.*

**Actinella richardsonii floribunda** A. Gray, Mem. Amer. Acad. II. **4:** 101. 1849.
=*Hymenoxys floribunda* (A. Gray) Cockerell.
"Rocky hills, as well as plains and creek bottoms, around Santa Fe," June and July, 1847, *Fendler* 460.
One of the most abundant plants on the gravelly hills around Santa Fe, growing only at the lower altitudes.

**Actinella rusbyi** A. Gray, Proc. Amer. Acad. **19:** 33. 1883.
=*Hymenoxys rusbyi* (A. Gray) Cockerell.
"Grassy slopes of the Mogollon Mountains," September, 1881, *H. H. Rusby.*

**Actinella scaposa mutica** A. Gray, Mem. Amer. Acad. II. **4:** 101. 1849.
=*Tetraneuris* sp.
"Woodlands from Pecos to San Miguel," August, 1847, *Fendler* 466.

**Actinella vaseyi** A. Gray, Proc. Amer. Acad. **17:** 219. 1882.
=*Hymenoxys vaseyi* (A. Gray) Cockerell.
"In the Organ Mountains," *G. R. Vasey.*
Occurs on the foothills of the Organs, not extending down upon the mesa or into the Rio Grande Valley.

**Adenophyllum wrightii** A. Gray, Smiths. Contr. Knowl. **5:** 92. 1853.
=*Hymenatherum neomexicanum* A. Gray.
"Hillsides near the copper mines," *Wright* 1280 in 1851.

**Amauria ? dissecta** A. Gray, Mem. Amer. Acad. II. **4:** 104. 1849.
=*Villanova dissecta* (A. Gray) Rydb.
"A few miles east of the Mora River," August, 1847, *Fendler* 537.
This plant, later named *Villanova chrysanthemoides* and *Bahia chrysanthemoides* by Doctor Gray, is common in the mountain ranges of New Mexico, growing usually at 2,100 and 2,400 meters. It has never been collected in its type locality since the days of Fendler.

**Antennaria latisquamea** Greene, Leaflets **1:** 145. 1905.
=*Antennaria anacleta* Greene, Leaflets **1:** 200. 1906, the latter being merely a new name for the former, which was a homonym.
"In the Black Range, New Mexico, on a shaded slope," September 30, 1904, *O. B. Metcalfe* 1433, altitude 3,000 meters.

**Antennaria marginata** Greene, Pittonia **3:** 290. 1898.
"New Mexico," *Dr. Edward Palmer.*

**Aplopappus spinulosus canescens** A. Gray, Mem. Amer. Acad. II. **4:** 75. 1849.
=*Sideranthus* sp.
"Between Santa Fe and the Rio del Norte," May, 1847, *Fendler* 395.

**Artemisia franserioides** Greene, Bull. Torrey Club **10:** 42. 1883.
"In deep shady woods of Pseudotsuga near the summits of the Pinos Altos Mountains," *E. L. Greene.*
One of the most distinct of all our species of Artemisia, found in most of the mountain ranges of New Mexico, as well as in southern Colorado.

**Artemisia microcephala** Wooton, Bull. Torrey Club **25:** 455. 1898.
"In the Organ Mountains," September 1, 1897, *E. O. Wooton* 504.

**Artemisia parryi** A. Gray, Proc. Amer. Acad. **7**: 361. 1867.

"Huefano Mts., New Mexico," *Dr. C. C. Parry* in September, 1867.

This must have been collected in Colorado, for there is a range of this name in that State and none, so far as the writer knows, in New Mexico. The name should certainly read Huerfano instead of Huefano.

**Artemisia wrightii** A. Gray, Proc. Amer. Acad. **19**: 48. 1883.

"Mountains around the copper mines," *Wright* 1279 in 1851.

**Aster bigelovii** A. Gray, Pac. R. Rep. **4**: 97. *pl. 10*. 1856.

=*Machaeranthera bigelovii* (A. Gray) Greene.

"Arroyos in the Sandia Mountains," *Bigelow* in 1853.

**Aster blepharophyllus** A. Gray, Smiths. Contr. Knowl. **5**: 77. 1853.

"Las Playas Springs," *Wright* 1164 in 1851.

**Aster boltoniae** Greene, Pittonia **3**: 248. 1897.

"In irrigated fields and along ditches in western Texas and southern New Mexico," collected by M. E. Jones at El Paso, and E. O. Wooton in the Mesilla Valley.

So the plant is founded, in part at least, upon New Mexican material. It is found only in the valley of the Rio Grande, usually along the irrigating ditches and in places where the ditch water overflows.

**Aster ericaefolius tenuis** A. Gray, Syn. Fl. **1**$^2$: 198. 1886.

=*Leucelene* sp.

"New Mexico," *Wright*.

**Aster fendleri** A. Gray, Mem. Amer. Acad. II. **4**: 66. 1849.

"On the Ocaté Creek," August, 1847, *Fendler* 372.

**Aster hesperius wootonii** Greene, Bull. Torrey Club **25**: 119. 1898.

=*A. wootonii* Greene.

"Eagle Creek, White Mountains," August 12, 1897, *E. O. Wooton* 329.

A common and showy plant along Eagle Creek in the vicinity of Gilmores Ranch growing in wet places along the edge of the stream, at an altitude of about 2,230 meters.

**Aster woodhousei** Wooton, Bull. Torrey Club **25**: 458. 1898.

"First collected near the Pueblo Indian village of Zuni," September, 1851, *Dr. S. W. Woodhouse*.

**Bahia biternata** A. Gray, Smiths. Contr. Knowl. **5**: 95. 1853.

"Gravelly hills near Ojo de Gavilan," *Wright* 1256 in 1851.

Unlike *B. dissecta*, this plant grows upon the dry mesas, especially along the dry water courses known as arroyos.

**Baileya multiradiata** Harv. & Gray in Emory, Mil. Recon. 144. *pl. 6*. 1848.

"Along the Del Norte," *Emory*.

No plant is more common than this upon the sandy mesas bordering the valley of the Rio Grande in southern New Mexico. It is found in the valley itself, but usually only on the sandhills.

**Bidens cognata** Greene, Leaflets **1**: 149. 1905.

"Black Range, New Mexico, at 9,500 feet," September 30, 1904, *O. B. Metcalfe* 1436.

**Bidens heterosperma** A. Gray, Smiths. Contr. Knowl. **5**: 90. 1853.

"Near the copper mines," *Wright* in 1851.

**Bidens tenuisecta** A. Gray, Mem. Amer. Acad. II. **4:** 86. 1849.

"Margins of Poñi Creek (between Bent's Fort and Santa Fe)," October, 1846, *Fendler* 449.

No one has collected in this locality since 1847.

**Bigelovia graveolens appendiculata** Eastwood, Proc. Calif. Acad. III. **1:** 74. *pl. 6*. 1897.

=*Chrysothamnus appendiculatus* (Eastw.) Heller.

"White Sands," *T. D. A. Cockerell.*

**Bigelovia graveolens latisquamea** A. Gray, Proc. Amer. Acad. **8:** 645. 1873.

=*Chrysothamnus latisquameus* (A. Gray) Greene.

"New Mexico," *Bigelow*.

**Brickellia betonicaefolia** A. Gray, Smiths. Contr. Knowl. **5:** 72. 1853.

=*Coleosanthus betonicaefolius* (A. Gray) Kuntze.

"Hills, near the copper mines," *Wright* 1137 in 1851.

**Brickellia fendleri** A. Gray, Mem. Amer. Acad. II. **4:** 63. 1849.

=*Eupatorium fendleri* A. Gray.

"Foot of mountains, on the sunny side along the creek, 11 miles above Santa Fe," July, 1847, *Fendler* 347.

Abundant on cliffs and in the crevices of rocks in the mountains east of Santa Fe, flowering in late summer.

**Brickellia rusbyi** A. Gray, Syn. Fl. $1^2$: 106. 1886.

=*Coleosanthus rusbyi* (A. Gray) Kuntze.

"Mountains of New Mexico," *H. H. Rusby* (other localities and collectors mentioned).

**Brickellia wrightii** A. Gray, Smiths. Contr. Knowl. **5:** 72. 1853.

=*Coleosanthus wrightii* (A. Gray) Britton.

"Hills, near the copper mines," *Wright* 1139 in 1851.

**Bulbostylis annua** Nutt. Journ. Acad. Phila. n. ser. **1:** 179. 1848.

=*Psathyrotes annua* (Nutt.) A. Gray.

"Rocky Mountains near Santa Fe," *William Gambel.*

Such is the locality given by Nuttall, but there is reason to believe that it is incorrect. The plant seems not to have been collected in New Mexico since, and the genus is one which reaches its fullest development farther west. This species occurs in Utah and Arizona and westward.

**Carduus perennans** Greene, Bull. Torrey Club. **25:** 125. 1898.

"White Mountains, at 7,000 feet," August 12, 1897; and in "Organ Mountains," July 7, 1897, *E. O. Wooton*.

Frequent in the White Mountains, on open slopes, but of rare occurrence, apparently, in the Organs.

**Carpochaete bigelovii** A. Gray, Smiths. Contr. Knowl. **3:** 89. 1852.

"On the boundary between Mexico and New Mexico," *Bigelow*.

Just what locality Doctor Gray understood by this I can not say, but certain statements of his in the second part of Plantae Wrightianae lead one to believe that the original specimens were collected either in the Organ Mountains or at the Copper Mines. In the herbarium of the New Mexico Agricultural College there are specimens from the Organ Mountains, only, and it seems probable that it was in these mountains that Bigelow first collected the plant. Here it is one of the commonest of the spring flowers, blooming in April and May, frequenting the drier slopes and more open parts of the canyons.

**Chrysopsis fulcrata** Greene, Bull. Torrey Club **25**: 119. 1898.

"At various places in the White Mountains and Organ Mountains, at elevations of 6,000 to 6,500 feet," *E. O. Wooton* 510, 511, 512, in 1897.

No. 510 was collected in Fillmore Canyon in the Organ Mountains. It is common in the range, growing in crevices in the faces of cliffs.

**Chrysothamnus bakeri** Greene, Pittonia **4**: 152. 1900.

"Near Chama," September 5, 1899, *C. F. Baker*.

**Chrysothamnus confinis** Greene, Pittonia **5**: 62. 1902.

"White Mountains," *E. O. Wooton* 379, August 23, 1897.

Collected at Blazers Mill; a common shrub along the ditch banks here.

**Chrysothamnus newberryi** Rydb. Bull. Torrey Club **31**: 652. 1904.

"Cañon Largo," *Doctor Newberry*.

**Cirsium neomexicanum** A. Gray, Smiths. Contr. Knowl. **5**: 101. 1853.

=*Carduus neomexicanus* (A. Gray) Greene.

"Side of the Organ Mountains," *Wright* 1417.

The most frequent species in this locality, occurring in the foothills and at the lower levels, on open, rocky slopes.

**Cirsium ochrocentrum** A. Gray, Mem. Amer. Acad. II. **4**: 110. 1849.

=*Carduus ochrocentrus* (A. Gray) Greene.

"Mountain sides around Santa Fe," July, 1847, *Fendler* 486.

Collected, no doubt, on the slopes just east of Santa Fe, where it is conspicuous. It extends to elevations of about 2,250 meters. Usually it is white-flowered, but occasionally pale purple heads are seen.

**Clavigera brachyphylla** A. Gray, Mem. Amer. Acad. II. **4**: 63. 1849.

=*Coleosanthus brachyphyllus* (A. Gray) Kuntze.

"Foot of high rocks, 2 miles east of the Mora River," August, 1847, *Fendler* 339.

Apparently very local in its distribution, for it has not been observed in the mountains just to the southwest.

**Coleosanthus ambigens** Greene, Bull. Torrey Club **25**: 118. 1898.

"White Mountains," August 13, 1897, *E. O. Wooton* 335.

The exact locality was at Gilmores Ranch.

**Coleosanthus axillaris** Greene, Leaflets **1**: 149. 1905.

"Southward slopes of hills of the Black Range, New Mexico, at about 6,000 feet," *O. B. Metcalfe* 1446, in 1904.

According to the label, the exact locality was on a rocky hillside 1 mile west of Hillsboro, at an altitude of about 1,620 meters, and the date of collection October 2, 1904.

**Coleosanthus melissaefolius** Greene, Leaflets **1**: 150. 1905.

"Organ Mountains, New Mexico, at 4,900 feet," September 1, 1897, *E. O. Wooton*.

A low shrub, abundant in the canyons and drier parts of the Organs; very closely related to *C. wrightii*, and perhaps hardly distinct.

**Coleosanthus modestus** Greene, Pittonia **4**: 230. 1900.

"Gray's Peak, Lincoln County," July 25, 1900, *F. S. Earle*.

The type number seems to be 490.

**Coleosanthus nepetaefolius** Greene, Pittonia **4**: 237. 1900.

"Salado Cañon, near Gray," September 2, 1900, *F. S. Earle*.

**Coleosanthus wootoni** Greene, Bull. Torrey Club **24**: 511. 1897.

"Organ Mountains," September, 1892, *E. O. Wooton*.

Common in the lower parts of the Organs, on dry slopes.

**Dieteria asteroides** Torr. in Emory, Mil. Recon. 142. 1848.

=*Machaeranthera asteroides* (Torr.) Greene.

"Elevated land between the del Norte and the waters of the Gila," *Emory* in 1847.

In Emory's journal, in the entry for October 16, we read: "We commenced the approach to the Mimbres Mountains over a beautiful rolling country, traversed by streams of pure water * * * a new species of dieteria, like an aster, with fine purple flowers." This must have been somewhere in the central or southwestern part of Sierra County.

**Dieteria gracilis** Nutt. Journ. Acad. Phila. n. ser. **1:** 177. 1848.

=*Sideranthus gracilis* (Nutt.) Rydb.

"Near Santa Fe," August, *William Gambel.*

One of the most abundant plants on the sandy mesas around Santa Fe.

**Diplopappus ericoides hirtella** A. Gray, Mem. Amer. Acad. II. **4:** 69. 1849.

=*Leucelene hirtella* (A. Gray) Rydb.

"Sides of ravines in arid places, Santa Fe; also on the Rio del Norte," May, June, 1847, *Fendler* 348.

**Erigeron arenarius** Greene, Bull. Torrey Club **25:** 121. 1898.

"Sand hills near Mesilla," June 17, 1897, *E. O. Wooton* 23.

Not very abundant, on dunes of almost pure sand, in the Mesilla Valley. Flowers in the middle of summer. The only species of Erigeron found in the valley, the others here, as in most other places in the Territory, being confined to the mountains. It grows along with one of the species of Aphanostephus with which it is easily confused.

**Erigeron canus** A. Gray, Mem. Amer. Acad. II. **4:** 67. 1849.

"Dry places on gravelly hills and at the foot of mountains, Santa Fe," May, June, 1847, *Fendler* 375.

**Erigeron cinereus** A. Gray, Mem. Amer. Acad. II. **4:** 68. 1849.

Three numbers are mentioned, 374, 380, and 385, all collected by Fendler at various places around Santa Fe in 1847. These are designated as varieties $\alpha$, $\beta$, and $\gamma$.

**Erigeron deustus** Greene, Leaflets **1:** 211. 1906.

"West fork of the Rio Gila," August 28, 1903, *O. B. Metcalfe.*

**Erigeron flagellaris** A. Gray, Mem. Amer. Acad. II. **4:** 68. 1849.

"Low, moist places along Santa Fe Creek," May, June, 1847, *Fendler* 381.

Everywhere in moist meadows and on hillsides in the mountains east of Santa Fe.

**Erigeron formosissimus** Greene, Bull. Torrey Club **25:** 121. 1898.

"From an altitude of 10,000 feet on Sierra Blanca Peak of the White Mountains," August 16, 1897, *E. O. Wooton* 352.

"Sierra Blanca Peak" is more commonly spoken of as White Mountain Peak.

**Erigeron neomexicanus** A. Gray, Proc. Amer. Acad. **19:** 2. 1883.

"On mountains at the copper mines," *Wright.*

**Erigeron pecosensis** Standley, Muhlenbergia **5:** 29. 1909.

"In a wet meadow along the Pecos River near Winsor's ranch," July 16, 1908, *Standley* 4358; altitude about 2,460 meters.

**Erigeron platyphyllus** Greene, Leaflets **1:** 145. 1905.

"Santa Rita Mountain," October 9, 1904, *O. B. Metcalfe* 1469.

**Erigeron pulcherrimus** Heller, Bull. Torrey Club **25:** 200. 1898.

"On sandy hills 10 miles north of Santa Fe," June 5, 1897, *A. A. Heller* 3664; altitude 1,740 meters.

**Erigeron rusbyi** A. Gray, Syn. Fl. **1**$^2$: 217. 1886.
"Mogollon Mountains," *H. H. Rusby*.

**Erigeron setulosus** Greene, Pittonia **4:** 319. 1901.
"Aztec," *C. F. Baker*.

**Erigeron stenophyllus** A. Gray, Pac. R. Rep. **4:** 98. 1856.
"On hillsides and steep banks of the Pecos," October, 1853, *Bigelow*.

**Erigeron wootonii** Rydb. Bull. Torrey Club **33:** 153. 1906.
"Valley of Santa Fe Creek, near irrigating ditches," May to July, 1847, *Fendler* 385.

**Eriocarpum serratum** Greene, Bull. Torrey Club **25:** 119. 1898.
=*Sideranthus serratus* (Greene).
"White Mountains at 6,800 feet," July 30, 1897, *E. O. Wooton* 251.
Collected on the south fork of Tularosa Creek east of the Mescalero Agency.

**Eriocarpum wootonii** Greene, Bull. Torrey Club **25:** 120. 1898.
=*Sideranthus wootonii* (Greene).
"On the White Mountains, at 6,500 feet elevation," August 19, 1897, *E. O. Wooton* 518.
Collected on the divide between the Gavilan and Eagle creeks. Only four specimens were distributed.

**Galinsoga parviflora semicalva** A. Gray, Mem. Amer. Acad. II. **4:** 98. 1853.
"Side of mountains at the copper mines," *Wright* 1268 in 1851.

**Gnaphalium strictum** A. Gray, Pac. R. Rep. **4:** 110. 1856.
"Banks of the Rio Grande, near Albuquerque," October, 1853, *Bigelow*.

**Grindelia scabra** Greene, Bull. Torrey Club **25:** 120. 1898.
"White Mountains," August 21, 1897, *E. O. Wooton* 224, 372; altitude, 1,900 meters.
A showy plant of the higher levels of the White Mountains.

**Grindelia subincisa** Greene, Pittonia **4:** 154. 1900.
"Chama," September 5, 1899, *C. F. Baker*.
The type number appears to be 683.

**Gutierrezia filifolia** Greene, Pittonia **4:** 55. 1899.
"Round Mountain," August 24, 1897, *E. O. Wooton*.

**Gutierrezia furfuracea** Greene, Repert. Sp. Nov. Fedde **7:** 195. 1909.
"At Cactus Flat, in the region of the upper Rio Gila, southeastern New Mexico, October 13, 1908, by Mr. E. A. Goldman."
This is in southwestern New Mexico instead of southeastern.

**Gutierrezia glomerella** Greene, Pittonia **4:** 54. 1899.
"From the Organ Mountains," in 1897, *E. O. Wooton* 449.
One of the commonest plants in this region, a pernicious weed of the ranges. It is found from the foothills of the Organs down across the surrounding mesas, occasionally extending even into the Rio Grande Valley.

**Gutierrezia goldmanii** Greene, Repert. Sp. Nov. Fedde **7:** 195. 1909.
"From the Florida Mountains, in extreme southern New Mexico," September 8, 1908, *E. A. Goldman*, altitude 1,740 meters.

**Gutierrezia juncea** Greene, Pittonia **4:** 56. 1899.
"Near Gray," August, 1898, *Miss Josephine Skehan* (other localities mentioned).

**Gutierrezia linearis** Rydb. Bull. Torrey Club **31:** 647. 1904.
"Gray, Lincoln County," in 1900, *F. S. Earle* 474.

**Gutierrezia longifolia** Greene, Pittonia **4:** 54. 1899.
"In the White Mountains," August, 1897, *E. O. Wooton* 377.
Collected near Blazers Mill, just below the Mescalero Agency.

**Gutierrezia tenuis** Greene, Pittonia **4:** 55. 1899.
"Foothills of the mountains back of Silver City," September 30, 1880, *E. L. Greene.*

**Helianthella majuscula** Greene, Leaflets **1:** 148. 1905.
"Black Range," 1904, *O. B. Metcalfe* 1435.

**Heterospermum tagetinum** A. Gray, Mem. Amer. Acad. II. **4:** 87. 1849.
"Woodlands, 12 miles west of Las Vegas," August, 1847, *Fendler* 534.
According to Doctor Gray, this is a synonym of *H. pinnatum* Cav.

**Hymenatherum neomexicanum** A. Gray, Proc. Amer. Acad. **19:** 40. 1883.
A new name for *Adenophyllum wrightii* A. Gray.

**Hymenoclea monogyra** Torr. & Gray, Mem. Amer. Acad. II. **4:** 79. 1849.
"Along the valley of the Gila," *Emory* in 1847.
This may have been collected in either Arizona or New Mexico, for Emory traveled along the Gila in both Territories. He must have seen the plant first in New Mexico, since it is abundant there.

**Hymenopappus arenosus** Heller, Bull. Torrey Club **25:** 200. 1898.
"Near Española, Santa Fe County," May 17, 1897, *A. A. Heller* 3542, altitude 1,680 meters.

**Hymenopappus flavescens** A. Gray, Mem. Amer. Acad. II. **4:** 97. 1849.
"Between San Miguel and Las Vegas," August, 1847, *Fendler* 464.

**Hymenopappus integer** Greene, Pittonia **3:** 249. 1897
"Mogollon Mountains," *H. H. Rusby* in 1881.

**Hymenopappus robustus** Greene, Bull. Torrey Club **9:** 63. 1882.
"Common on the sandy plains of New Mexico."

**Hymenoxys chrysanthemoides juxta** Cockerell, Bull. Torrey Club **31:** 503. 1904.
"Mangas Springs," June 9, 1903, *O. B. Metcalfe* 118, altitude 1,430 meters.

**Hymenoxys chrysanthemoides mearnsii** Cockerell, Bull. Torrey Club **31:** 506. 1904.
"Dog Spring," May 26, 1892, *E. A. Mearns.*

**Hymenoxys metcalfei** Cockerell, Bull. Torrey Club **31:** 492. 1904.
"Burro Mountains," 1903, *O. B. Metcalfe* 170.

**Hymenoxys olivacea** Cockerell, Bull. Torrey Club **31:** 297. 1904.
"Hanover Hills," August 9, 1895, *Miss A. Isabel Mulford.*

**Laciniaria lancifolia** Greene, Bull. Torrey Club **25:** 118. 1898.
"In marshy land at 6,300 feet in the White Mountains," July 31, 1897, *E. O. Wooton* 254.
Collected on the South Fork of Tularosa Creek at the Mescalero Agency.

**Laphamia cernua** Greene, Bull. Torrey Club **25:** 122. 1898.
"Organ Mountains, at 6,500 feet altitude," September 4, 1897, *E. O. Wooton* 476.
Apparently very rare, for it has not been collected except this once.

**Layia neomexicana** A. Gray, Smiths. Contr. Knowl. **5:** 98. 1853.
"Near Santa Barbara."
Possibly the label of this plant was wrong, for the genus Layia is a Californian one, and this plant has not been collected in New Mexico in late years.

**Leucelene ericoides serotina** Greene, Pittonia **3:** 149. 1896.

"In New Mexico."

**Linosyris bigelovii** A. Gray, Pac. R. Rep. **4:** 98. 1856.

=*Chrysothamnus bigelovii* (A. Gray) Greene.

"Hills and arroyos, Cienegella, above Albuquerque," *Bigelow* in 1853.

Just what or where Cienegella is I have been unable to determine. The name is evidently misspelled.

**Machaeranthera canescens latifolia** A. Gray, Smiths. Contr. Knowl. **5:** 75. 1853.

"Near the copper mines," *Wright* 1152 in 1851.

**Machaeranthera linearis** Greene, Bull. Torrey Club **24:** 511. 1897.

"Sandy fields of the Mesilla Valley, flowering in autumn," *E. O. Wooton.*

One of the commonest plants in the Rio Grande Valley in this locality; a troublesome weed in cultivated fields.

**Machaeranthera tanacetifolia humilis** A. Gray, Smiths. Contr. Knowl. **5:** 74. 1853.

=*Machaeranthera humilis* (A. Gray) Standley.

"Near Ojo de Gavilan," *Wright* 1151 in 1851.

**Pectis taxifolia** Greene, Leaflets **1:** 148. 1905.

"Black Range," 1904, *O. B. Metcalfe* 1440.

This seems indistinguishable from *Chrysactinia mexicana* A. Gray.

**Pericome caudata** A. Gray, Smiths. Contr. Knowl. **5:** 82. 1853.

"Among rocks, on the sides of mountains, at the copper mines," *Wright* 1195 in 1851.

**Perityle coronopifolia** A. Gray, Smiths. Contr. Knowl. **5:** 82. 1853.

"Sides of the mountains at the copper mines," *Wright* 1196 in 1851.

**Pyrrocoma amplectens** Greene, Leaflets **2:** 10. 1909.

"Mogollon Mountains," *O. B. Metcalfe* in 1903.

**Ratibida tagetes cinerea** Standley, Muhlenbergia **5:** 30. 1909.

"At Harrison's ranch near Pecos, New Mexico, August 21, 1908, *Standley* 5156, growing on a dry hillside at an altitude of about 6,700 feet."

**Sanvitalia aberti** A. Gray, Mem. Amer. Acad. II. **4:** 87. 1849.

"Woodlands, between Santa Fe and Pecos," August, 1847, *Fendler* 538.

Very abundant in this region, growing on the low hills in dry places.

**Schkuhria neomexicana** A. Gray, Mem. Amer. Acad. II. **4:** 96. 1849.

=*Achyropappus neomexicanus* A. Gray.

"Margin of fields, Santa Fe," July, August, 1847, *Fendler* 458.

Not uncommon on the low hills about Santa Fe, but not extending into the mountains.

**Senecio bigelovii** A. Gray, Pac. R. Rep. **4:** 111. 1856.

"In mountain arroyos, near Camp Douglas," October, 1853, *Bigelow.*

I have not been able to determine just where Camp Douglas was, but it was somewhere in central New Mexico, between Albuquerque and the Pecos River.

**Senecio canovirens** Rydb. Bull. Torrey Club **27:** 187. 1900.

"White Mountains," *E. O. Wooton* 244 in 1897 (other localities and collectors mentioned).

**Senecio cardamine** Greene, Bull. Torrey Club **8:** 98. 1881.

"On cold northward slopes of the higher Mogollon Mountains," *E. L. Greene* in April, 1881.

**Senecio cynthioides** Greene, Leaflets **1:** 212. 1906.

"Hillsides along Turkey Creek in the Mogollones," August 23, 1903, *C. B. Metcalfe.*

**Senecio fendleri** A. Gray, Mem. Amer. Acad. II. **4:** 108. 1849.

"Foot of high mountains, along the creek, 12 miles above Santa Fe," June and July, 1847, *Fendler* 478 and 480, the latter number not distributed.

One of the most abundant species in the mountains east of Santa Fe, at altitudes of 2,100 to 2,400 meters, on open hillsides.

**Senecio mogollonicus** Greene, Leaflets **1:** 212. 1906.

"Dry flats on the West Fork of the Gila, in the Mogollones," August 7, 1903, *O. B. Metcalfe.*

**Senecio neomexicanus** A. Gray, Proc. Amer. Acad. **19:** 55. 1883.

"In New Mexico," *Wright* and other collectors.

A common species of the lower parts of the Organ Mountains, occurring in rather dry places; perhaps first collected in this range.

**Senecio quaerens** Greene, Leaflets **1:** 214. 1906.

A new name for *S. prionophyllus* Greene.

**Senecio prionophyllus** Greene, Leaflets **1:** 212. 1906.

=*Senecio quaerens* Greene.

"Moist flats on the West Fork of the Gila, in the Mogollones," August 7, 1903, *O. B. Metcalfe.*

**Senecio rusbyi** Greene, Bull. Torrey Club **9:** 64. 1882.

"Mogollon Mountains," August, 1881, *H. H. Rusby.*

**Senecio sanguisorboides** Rydb. Bull. Torrey Club **27:** 170. 1900.

"Santa Fe Canyon," *A. A. Heller* 3820 in 1897.

A conspicuous plant in the mountains east of Santa Fe, at elevations of 2,100 to 2,700 meters, growing in very moist places, especially along the edges of mountain streams.

**Senecio toluccanus microdontus** A. Gray, Syn. Fl. **1²:** 388. 1886.

=*Senecio microdontus* (A. Gray) Heller.

"Pinos Altos Mountains," *E. L. Greene* (mention made of other localities and collectors).

**Senecio wootonii** Greene, Bull. Torrey Club **25:** 122. 1898.

"At an altitude of 7,000 feet on the White Mountains," August 15, 1897, *E. O. Wooton* 491.

Collected along Eagle Creek. Only two or three sheets were secured.

**Simsia? scaposa** A. Gray, Smiths. Contr. Knowl. **5:** 98. 1853.

=*Encelia scaposa* A. Gray.

"Stony hills between the Mimbres and the Rio Grande," *Wright* in 1851.

**Solidago aureola** Greene, Pittonia **4:** 236. 1900.

"El Capitan Mountains, at 8,000 feet, in the pine belt," July 28, 1900, *F. S. Earle.*

**Stevia macella** A. Gray, Smiths. Contr. Knowl. **5:** 70. 1853.

"On shaded rocky cliffs of Coppermine Creek," *Wright* 1130 in 1851.

According to Doctor Gray this is a synonym of *S. micrantha* Lag.

**Tetradymia filifolia** Greene, Bull. Torrey Club **25:** 123. 1898.

"Round Mountain, of the White Mountain Range," *E. O. Wooton* 183 in 1897.

**Tetraneuris angustifolia** Rydb. Bull. Torrey Club **32:** 128. 1905.

"White Mountains," *E. O. Wooton* 374 in 1897.

**Tetraneuris ivesiana** Greene, Pittonia **3:** 269. 1897.

"On the Rio Zuni," *Dr. S. W. Woodhouse* in 1851; also collected by Doctor Newberry upon the Ives Expedition, May 14, 1858.

**Tetraneuris trinervata** Greene, Pittonia **3:** 267. 1897.
"Sandia Mountains," *J. M. Bigelow* in 1853.

**Thelesperma formosum** Greene, Pittonia **5:** 56. 1902.
"Near Santa Fe," June, 1897, *A. A. Heller* 3747.

**Townsendia eximia** A. Gray, Mem. Amer. Acad. II. **4:** 70. 1849.
"Sides of high mountains, Santa Fe Creek, and prairies on the Mora River," June to August, 1847, *Fendler* 353.

One of the commonest and handsomest flowers of this region, frequenting steep and often rather dry hillsides along with *Pinus scopulorum*, at elevations of from 2,100 to 2,500 meters.

**Townsendia fendleri** A. Gray, Mem. Amer. Acad. II. **4:** 70. 1849.
"Gravelly hillsides, Santa Fe," May to August, 1847, *Fendler* 350.

This is a plant of the sandy mesas and plains, flowering in the spring and early summer, while *T. eximia*, a very different species, of course, is found only in the mountains and blooms in late summer and autumn.

**Townsendia formosa** Greene, Leaflets **1:** 213. 1906.
"In the Black Range," *O. B. Metcalfe* 1434 in 1904.

A very distinct species that has been collected in the White and Sacramento mountains, and in the Black and Mogollon ranges.

**Townsendia sericea papposa** A. Gray, Mem. Amer. Acad. II. **4:** 69. 1849.
"Santa Fe, on arid hillsides, less frequently in grassy places," April and May, 1847, *Fendler* 349.

**Villanova chrysanthemoides** A. Gray, Smiths. Contr. Knowl. **5:** 96. 1853.
=*Villanova dissecta* (A. Gray) Rydb.
"Sides of mountains, at the copper mines."

**Wootonia parviflora** Greene, Bull. Torrey Club **25:** 122. 1898.
"On plains near the White Sands," August 25, 1897, *E. O. Wooton* 393.

A plant of not infrequent occurrence in this region, where it has been collected at several different times.

## CICHORIACEAE.

**Agoseris graminifolia** Greene, Bull. Torrey Club **25:** 124. 1898.
"At 7,000 feet altitude in the White Mountains, in moist land," August 13, 1897, *E. O. Wooton* 513.

Collected at Gilmore's Ranch. Only two or three specimens were secured.

**Chaptalia alsophila** Greene, Leaflets **1:** 158. 1905.
"Black Range, New Mexico, at 7,000 feet, on shady northward slopes," October 4, 1904, *O. B. Metcalfe* 1454.

**Crepis ambigua** A. Gray, Mem. Amer. Acad. II. **4:** 114. 1849.
=*Hieracium fendleri* Schultz Bip.
"Level, grassy places along Santa Fe Creek," June to August, 1847, *Fendler*.

**Hieracium brevipilum** Greene, Bull. Torrey Club **9:** 64. 1882.
"Mogollon Mountains," August, 1881, *H. H. Rusby*.

**Hieracium carneum** Greene, Bot. Gaz. **6:** 184. 1881.
"South base of the Pinos Altos Mountains, New Mexico, in woods of *Quercus hypoleuca* and *Q. emoryi*," flowering in October, 1880, *E. L. Greene*.

**Hieracium fendleri** Schultz Bip. Bonplandia **9:** 173. 1861.
A new name for *Crepis ambigua* A. Gray.

**Hieracium rusbyi** Greene, Bull. Torrey Club **9:** 64. 1882.
"Mogollon Mountains," August, 1881, *H. H. Rusby*.

**Macrorhynchus purpureus** A. Gray, Mem. Amer. Acad. II. **4:** 114. 1849.
=*Agoseris purpurea* (A. Gray) Greene.
"Grassy places, bottom of Santa Fe Creek," July, 1847, *Fendler*.
Of rather sparing occurrence in moist meadows throughout the Santa Fe and Las Vegas mountains.

**Malacothrix fendleri** A. Gray, Smiths. Contr. Knowl. **5:** 104. 1853.
"Low, sandy banks of the Rio del Norte."

**Ptiloria neomexicana** Greene, Bull. Torrey Club **25:** 123. 1898.
"Mesas near Las Cruces," July 2, 1897, *E. O. Wooton* 482.

**Rafinesquia neomexicana** A. Gray, Smiths. Contr. Knowl. **3:** 103. 1852.
In spite of its specific name, this came originally from Texas.

**Stephanomeria thurberi** A. Gray, Mem. Amer. Acad. II. **5:** 325. 1854.
=*Ptiloria thurberi* (A. Gray) Greene.
"On the Sierra de los Animos, Sonora," June, 1851, *Thurber*.
It is doubtful whether this came from Sonora or New Mexico. The name of the range should be Sierra de las Animas.

**Uropappus pruinosus** Greene, Leaflets **1:** 213. 1906.
"Southwestern New Mexico and adjacent Arizona," *E. L. Greene* in 1877, *O. B. Metcalfe* in 1905.

## LIST OF NEW BINOMIALS.

In the preparation of the foregoing list it was found advisable to make several new combinations in order to bring the nomenclature up to date. They are as follows:


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|---|---|
| **Agastache lanceolata** (A. Gray) Standley | 212 |
| *Cedronella cana lanceolata* A. Gray. | |
| **Agastache neomexicana** (Briquet) Standley | 211 |
| *Brittonastrum neomexicanum* Briquet. | |
| **Agastache rupestris** (Greene) Standley | 212 |
| *Cedronella rupestris* Greene. | |
| **Chamaesyce neomexicana** (Greene) Standley | 199 |
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# A BIBLIOGRAPHY OF NEW MEXICAN BOTANY.

By Paul C. Standley.

## INTRODUCTION.

This paper has been prepared to give the student of New Mexican botany the obvious advantages of a special bibliography. Since no general flora of the Territory has been compiled, the results of the work of various earlier investigators are available only in scattered publications, some of them of such a character that they would not ordinarily be referred to. A reasonably complete bibliography will prevent oversights and save the labor of long and sometimes fruitless search.

A bibliography of New Mexican botany was suggested by the examination of a similar paper recently published in the University of Colorado Studies listing the literature of the plant life of that State. Several such lists of botanical papers had been published earlier, like those of Mr. C. V. Piper in his Flora of Washington and of Mr. J. W. Blankinship in the Montana Agricultural College Science Studies, but none that the writer has seen is so comprehensive as this more recent one. Piper lists but 54 titles and Blankinship still fewer, while for Colorado more than 500 publications are cited as dealing more or less directly with the flora of that State. The titles of the Colorado list cover a wide range of subjects, while those of the earlier ones were confined chiefly if not entirely to taxonomic botany.

The present paper is modeled upon that compiled for Colorado with certain modifications. The latter includes many titles useful only in ecological study, like those dealing with the meteorology and geology, and with the soils of the State. No such papers are entered here, because practically no work in plant ecology has been done in New Mexico, and it would require a specialist to select the publications that would be of use in that line of investigation.

The list is made up primarily of the works dealing with taxonomic botany, especially those in which new species are described from New Mexican material. Some definite references to New Mexican

specimens in monographs have been included. Articles dealing with plant distribution or ecology in the Southwest are mentioned whenever they are considered applicable to New Mexico. Publications upon economic botany have been cited in every case where found. No attempt has been made to complete the bibliography of the lower cryptogams; little is known of these in the Southwest.

This bibliography was prepared originally from the botanical library of the New Mexico Agricultural College, but at the National Herbarium several titles have been added. Some have been overlooked, no doubt. Most of the works listed are accessible in any good botanical library, but there have been included a few unpublished theses prepared by students of the Agricultural College and preserved in the library of that institution. Some of these are papers of considerable value.

## LIST OF WORKS.

**Bailey,** Vernon. Biological survey of Texas. U. S. Dept. Agr. Biol. Surv. N. Amer. Fauna **25**: 1–222. 1903.

Contains notes upon life zones of southeastern New Mexico with maps showing distribution of certain plants in that and adjoining areas.

——— Sleepy grass and its effect on horses. Science n. ser. **17**: 392–393. 1903.

An account of the properties of *Stipa vaseyi*, a New Mexican grass.

——— Sleepy grass. Plant World **6**: 109–110. 1903.

Abstract of the preceding.

**Bartlett,** H. H. The geographic ranges of certain Junci poiophylli. Rhodora **11**: 155–157. 1909.

Contains a discussion of the range of *Juncus brachyphyllus* with the conclusion that it has its type locality in New Mexico.

**Blount,** A. E. Cañaigre. N. Mex. Agr. Exp. Sta. Bull. **14**: 37–44. 1894.

A discussion of *Rumex hymenosepalus* from an economic standpoint.

**Bigelow,** J. M. General description of the botanical character of the country [traversed by Whipple's expedition]. Pac. R. Rep. **4**$^{5}$: 1–16. 1856.

——— Description of forest trees. Ibid. 17–26.

Several of the trees are New Mexican.

**Blumer,** J. C. Two junipers of the Southwest. Plant World **9**: 86–91. 1906.

The occurrence of *Juniperus pachyphloea* and *J. monosperma* is discussed.

**Bray,** William L. On the relation of the flora of the lower Sonoran zone in North America to the flora of the arid zones of Chile and Argentina. Bot. Gaz. **26**: 121–147. 1898.

This and the following papers, although not dealing directly with New Mexican botany, are of value because of their application to New Mexican areas.

——— The ecological relations of the vegetation of western Texas. Bot. Gaz. **32**: 99–123, 195–217, 262–291. 1901.

——— The vegetation of the sotol country in Texas. Bull. Univ. Tex. **60**: 1–24. 1905.

——— Distribution and adaptation of the vegetation of Texas. Bull. Univ. Tex. **82**: 1–108. pl. 1–14. 1906.

——— *See also* Uline, E. B.

**Briquet,** John. Description de quelques espéces nouvelles ou peu connues du genre Brittonastrum. Ann. Cons. Jard. Genève **6:** 157–162. 1902.
Describes *Brittonastrum greenei* and *B. neomexicanum,* from New Mexico.

**Britton,** N. L. A new species of Cyperus. Bull. Torrey Club **11:** 29. 1884.
Describes *Cyperus rusbyi,* from New Mexico.

——— John Strong Newberry. Bull. Torrey Club **20:** 89–98. 1893.
An account of the life of one of the earlier botanical explorers of New Mexico.

———, and **Rose,** J. N. New or noteworthy North American Crassulaceae. Bull. N. Y. Bot. Gard. **3:** 1–45. 1903.
Describes 3 new species from New Mexico.

**Bush,** B. F. The North American species of Fuirena. Rep. Mo. Bot. Gard. **15:** 87–99. 1905.
Several new species described, of which *F. cylindrica* is thought to come from New Mexico.

**Canby,** Wm. M. Some reminiscences of the late August Fendler. Bot. Gaz. **10:** 285–290, 301–304, 319–322. 1885.
An account of the life of one of the earliest botanical collectors in New Mexico.

**Clements,** F. E. *See* Pound, Roscoe.

**Cockerell,** T. D. A. Life zones in New Mexico. Bull. N. Mex. Agr. Exp. Sta. **15:** 52–59. 1895.
Treats the subject chiefly from an entomological standpoint, but mentions botanical aspects.

——— Some western weeds, and alien weeds in the West. Bot. Gaz. **20:** 502. 1895.
Deals with the occurrence of certain native and introduced weeds in the Territory.

——— Life zones in New Mexico. N. Mex. Agr. Exp. Sta. Bull. **24:** 1–44. 1897.
The life zones are defined by the occurrence of characteristic plants and animals in them.

——— Notes on New Mexico flowers and their insect visitors. Bot. Gaz. **24:** 104–107. 1897.
Localities for various plants are mentioned.

——— Abnormal leaves and flowers. Bot. Gaz. **24:** 293–294. 1897.
Records the finding of abnormal forms of several New Mexican plants.

——— A new southwestern Sophia. Bull. Torrey Club **25:** 460. 1898.
*Sophia halictorum* described.

——— *Eschscholtzia mexicana parvula.* Bot. Gaz. **26:** 279. 1898.
Mentions the occurrence of this plant in southern New Mexico.

——— Vernal phenomena in the arid region. Amer. Nat. **33:** 39–43. 1899.
An account of the date of flowering of various plants.

——— An alien Clematis in New Mexico. Science n. ser. **10:** 898–899. 1899.
Mentions the introduction of *Clematis cruxflava* near Las Vegas, and describes the plant.

——— Notes on some southwestern plants. Bull. Torrey Club **27:** 87–89. 1900.
Describes *Sphaeralcea lobata perpallida* from New Mexico.

——— The lower and middle Sonoran zones in Arizona and New Mexico. Amer. Nat. **34:** 285–293. 1900.
Discusses the occurrence of characteristic plants in these zones.

——— Some plants of New Mexico. Bot. Gaz. **29:** 280–281. 1900.
Three new subspecies and one new hybrid described.

——— A new Sophia. Bull. Torrey Club **28:** 48–49. 1901.
*Sophia andrenarum* and *S. andrenarum osmiarum* described as new.

——— Flower and insect records from New Mexico. Entomological News **1901:** 38–43. 1901.
*Fallugia micrantha* described.

**Cockerell**, T. D. A. A new Sphaeralcea. Bot. Gaz. **32:** 60. 1901.
*Sphaeralcea martii* described from New Mexico.

——— A new Cypripedium. Proc. Biol. Soc. Washington **14:** 178. 1901.
*Cypripedium veganum* described from New Mexico.

——— A new Ribes from New Mexico. Proc. Biol. Soc. Washington **15:** 99–100. 1902.
*Ribes leptanthum veganum* described.

——— A new Heliotropium. Bot. Gaz. **33:** 378–379. 1902.
*Heliotropium xerophilum* described from New Mexico.

——— A variable larkspur. Bot. Gaz. **34:** 453–454. 1902.
*Delphinium sapellonis* described from New Mexico.

——— Some New Mexico plants. Torreya **2:** 154–156. 1902.
*Astragalus simulans* and *Aragallus pinetorum veganus* described.

——— Flowers and insects in New Mexico. Amer. Nat. **36:** 809–817. 1902.
Stations are given for numerous New Mexican plants.

——— A new oak. Torreya **3:** 7–8. 1903.
*Quercus rydbergiana* described from New Mexico.

——— Notes on New Mexico oaks. Torreya **3:** 83–86. 1903.
Notes upon the differences between the species of Quercus found about Las Vegas.

——— Two orchids from New Mexico. Torreya **3:** 139–141. 1903.
*Corallorhiza grabhami* described as new, and notes on *C. vreelandii.*

——— A new cocklebur from New Mexico. Proc. Biol. Soc. Washington **16:** 9–10. 1903.
Description of *Xanthium commune wootoni.*

——— A new subgenus for *Nyctaginia cockerellae.* Proc. Biol. Soc. Washington **16:** 52. 1903.

——— A new Hypholoma. Journ. Mycology **10:** 108–109. 1904.
A new species from New Mexico described.

——— The roses of Pecos, New Mexico. Proc. Acad. Phila. **1904:** 108–118. 1904.
Descriptions of *Rosa pecosensis* and *R. neomexicana* and list of plants collected about Pecos.

——— The North American species of Hymenoxys. Bull. Torrey Club **31:** 461–509. pls. 20–23. 1904.
Describes several new plants in this genus from New Mexico.

——— Contributions to the natural history of the Rocky Mountains. I. Univ. Colo. Stud. **3:** 45–50. 1905.
Contains notes on New Mexican weeds.

——— *Sisymbrium vaseyi* (Coulter) Watson. Muhlenbergia **4:** 5. 1908.
Mentions the occurrence of this plant in the Las Vegas Mountains.

——— *See also* Nelson, Aven.

——— *See also* Pollard, C. L.

**Cockerell,** Wilmatte Porter. A trip to the Truchas Peaks, New Mexico. Amer. Nat. **37:** 887–891. 1903.
Besides general notes on the flora of the region includes a list of plants collected.

**Coulter,** John M. Preliminary revision of the North American species of Cactus, Anhalonium, and Lophophora. Contr. Nat. Herb. **3:** 91–132. 1894.
Both this and the following contain numerous references to New Mexican collections.

——— Preliminary revision of the North American species of Echinocactus, Cereus, and Opuntia. Contr. Nat. Herb. **3:** 367–462. 1896.

**Coulter,** John M. Botany of Western Texas. Contr. Nat. Herb. **2:** 1–588. 1891–94.
Includes many of the plants of southern New Mexico.[a]

**Coulter,** J. M., and Rose, J. N. Revision of the North American Umbelliferae. 261 p. Crawfordsville, Indiana, December, 1888.
Many species are referred definitely to New Mexican localities.

——— and ——— Monograph of the North American Umbelliferae. Contr. Nat. Herb. **7:** 1–256. 1900.
Many references are made to New Mexican collections.

**Coville,** Frederick V. Revision of the United States species of the genus Fuirena. Bull. Torrey Club **17:** 1–8. 1890.
New Mexican material is mentioned.

——— Three editions of Emory's Report, 1848. Bull. Torrey Club **23:** 90–92. 1896.
A discussion of the editions and dates of publication of one of the earliest works dealing with New Mexican botany.

——— *Ribes mescalerium,* an undescribed currant from New Mexico and Texas. Proc. Biol. Soc. Washington **13:** 195–198. 1900.

——— and MacDougal, D. T. Desert Botanical Laboratory of the Carnegie Institution. Published by the Carnegie Institution. 58 p. November, 1903.
Contains an account of the Tularosa Desert and the White Sands, with notes upon their floras.

**Dewey,** L. H. Distribution of the Russian thistle in North America. Bot. Gaz. **20:** 501. 1895.
Contains a map showing the occurrence of the weed in New Mexico.

**Eastwood,** Alice. Report upon a small collection of plants from the White Sands of New Mexico. Proc. Cal. Acad. Sci. III. **1:** 72–75. 1897.
Includes descriptions of three new subspecies. The paper is accompanied by a note concerning the locality written by Prof. T. D. A. Cockerell.

**Eaton,** D. C. Ferns of the southwest. Rep. U. S. Geogr. Surv. Wheeler **6:** 299–340. 1878.
New Mexican localities mentioned.

——— New or little known ferns of the United States, No. 11. Bull. Torrey Club **8:** 111. 1881.
Mentions specimens from New Mexico.

**Eggleston,** W. W. Crataegus in New Mexico. Torreya **7:** 235–236. 1907.
*Crataegus wootoniana* described.

**Emory,** W. H. Notes of a military reconnaissance from Fort Leavenworth, in Missouri, to San Diego, in California. 416 p. 1848.
Contains numerous references to the general botanical features of the route.

**Engelmann,** George. [Report on Cactaceae.] *In* Emory, Mil. Recon. 157–158. pl. [13, 14]. 1848.
Describes three new cacti from New Mexico.

——— Botanical appendix. *In* Wisliz. Mem. North. Mex. p. 87–115. 1848.
Includes descriptions of numerous new species from New Mexico.

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[a] While this was not designed to cover New Mexican botany, it is nevertheless the only work that applies at all fully to the flora of southern New Mexico. On account of the close relationship existing between the flora of that district and that of western Texas, this book can be used as a manual of the flora of the southern part of the Territory, with many limitations of course. Doctor Coulter's work was published so many years ago that many new species have since been recognized in the floras of both areas; and many plants occur in southern New Mexico that are not found to the south and east in Texas.

**Engelmann,** George. Synopsis of the Cactaceae of the territory of the United States and adjoining regions. Proc. Amer. Acad. **3:** 259–314. 1856.
Numerous species described from New Mexico.

——— [Euphorbia.] *In* Torrey, Botany of the boundary. *See* Torrey, John.

——— Cactaceae of the Boundary. *In* Bot. Mex. Bound., i. e., *in* Emory, U. S. & Mex. Bound. Surv. **2**[1][b]: 1–78. pl. 1–75. 1859.
Contains descriptions of numerous New Mexican species.

——— Description of the Cactaceae. Pac. R. Rep. **4**[5]**:** 27–58. pl. 1–24. 1856.
Many New Mexican Cactaceae described.

——— Revision of the Oenotherae of the subsection Onagra. *In* A. Gray's enumeration of the plants of Doctor Parry's collection in the Rocky Mountains. Supplement 2. Amer. Journ. Sci. II. **34:** 333–335. 1862.
A new subspecies described from New Mexico.

——— Some additions to the North American flora. Bot. Gaz. **6:** 235–238. 1881.
*Portulaca suffrutescens* described from New Mexico.

**Ensign,** Edgar T. Report on the forest conditions of the Rocky Mountains, especially in the State of Colorado, the Territories of Idaho, Montana, Wyoming, and New Mexico. U. S. Dept. Agr. For. Div. Bull. **2:** 41–152. 1889.
Contains a list of the trees of New Mexico.

**Evans,** W. H. Hydrangeaceaceae. N. Amer. Fl. **22**[2]**:** 174. 1905.
Description of *Philadelphus mearnsii* from New Mexico.

**Ferguson,** A. M. Crotons of the United States. Rep. Mo. Bot. Gard. **12:** 33–73. pls. 4–31. 1901.
Numerous references to New Mexican collections.

**Ferns of New Mexico.** Bull. Torrey Club **8:** 36. 1881.
A list of the ferns collected in New Mexico by H. H. Rusby.

**Fisher,** E. M. Revision of the North American species of Hoffmanseggia. Contr. Nat. Herb. **1:** 143–150. 1892.
*Hoffmanseggia falcaria rusbyi* described as new.

**Gerard,** W. R. Some fungi from New Mexico. Bull. Torrey Club **8:** 34. 1881.
Includes description of *Aecidium rusbyi.*

**Goss,** Arthur. Ash analyses of some New Mexico plants. N. Mex. Agr. Exp. Sta. Bull. **44:** 1–14. 1903.
Contains the results of analyses of the ash of various native plants of southern New Mexico.

**Gray,** Asa. Plantae Fendlerianae Novi-Mexicanae: An account of a collection of plants made chiefly in the vicinity of Santa Fe, New Mexico, by August Fendler; with descriptions of the new species, critical remarks, and characters of other undescribed or little known plants from surrounding regions. Mem. Amer. Acad. n. ser. **4:** 1–116. 1849.
The earliest work of importance dealing with New Mexican botany. Contains descriptions of many new species from New Mexico.

——— Plantae Wrightianae Texano-Neo-Mexicanae. Parts I, II, Smiths. Contr. Knowl. **3:** 1–146. 1852; **5:** 1–119. 1853.
Part I, treating of a collection of plants made by Charles Wright in an expedition from Texas to New Mexico in 1849, contains descriptions of one or two New Mexican plants. Part II, on a collection made by Charles Wright in western Texas, New Mexico, and Sonora in 1851 and 1852, contains descriptions of many such plants.

——— Brief characters of some new genera and species of Nyctaginaceae, principally collected in Texas and New Mexico. Amer. Journ. Sci. II. **15:** 319–324. 1853.
*Boerhaavia purpurascens* described from New Mexico.

——— Plantae novae Thurberianae: The characters of some new genera and species of plants in a collection made by George Thurber, esq., of the late Mexican Boundary Commission, chiefly in New Mexico and Sonora. Mem. Amer. Acad. n. ser. **5:** 297–328. 1854.
Several new species described from New Mexico.

**Gray,** Asa. [Compositae, etc.] *In* Torrey, Botany of the Boundary. *See* Torrey, John.

——— Synopsis of the North American species of Physalis. Proc. Amer. Acad. **10:** 62–68. 1864.
Includes description of *Physalis fendleri.*

——— Characters of new plants of California and elsewhere, principally of those collected by W. H. Brewer. . . Proc. Amer. Acad. **7:** 327–401. 1867.
Three new species described from New Mexico.

——— Revision of the North American Polemoniaceae. Proc. Amer. Acad. **10:** 247–282. 1870.
Several new subspecies described from New Mexico.

——— Characters of new species, etc. Proc. Amer. Acad. **12:** 54–84. 1876.
Descriptions of *Galium brandegei* and *Stachys rothrockii* from New Mexico.

——— Classification of the botanical collections made during the San Juan reconnaissance of 1877, in Colorado and New Mexico. Annual report of the Chief of Engineers for 1878, Appendix SS, 1833–40. 1878.
No new species described from New Mexico, but the occurrence of numerous plants in the northwestern part of the Territory is mentioned.

——— Miscellaneae of the North American Flora. Proc. Amer. Acad. **16:** 105–108. 1880.
A new species and a new subspecies described from New Mexico.

——— Novitiae arizonicae . . . : Characters of the new plants of certain recent collections, mainly in Arizona and adjacent districts. Proc. Amer. Acad. **17:** 199–230. 1882.
Several new species described from New Mexico.

——— Characters of new Compositae, with revisions of certain genera, and critical notes. Proc. Amer. Acad. **19:** 1–73. 1883.
*Erigeron neomexicanus* and *Senecio neomexicanus* described as new.

——— Miscellaneous genera and species. Proc. Amer. Acad. **19:** 74–96. 1883.
*Sambucus melanocarpa* described from New Mexico.

——— Synoptical flora of North America, vol. I, pt. II, 480 p.; vol. II, pt. I, 494 p. New York, 1886.
Contains descriptions of several new plants from New Mexico.

——— Revision of some polypetalous genera and orders precursory to the Flora of North America. Proc. Amer. Acad. **22:** 270–306. 1887.
*Sida neomexicana* described from New Mexico.

**Gray,** Asa, and Torrey, John. Revision of the Eriogoneae. Proc. Amer. Acad. **8:** 146–200. 1870.
*Eriogonum microthecum fendlerianum* described from New Mexico.

**Greene,** E. L. Notes on certain silkweeds. Bot. Gaz. **5:** 64–65. 1880.
*Asclepias uncialis* described from near Silver City.

——— New species of plants from New Mexico. Bot. Gaz. **6:** 156–158. 1881.
Six species described.

——— New plants of New Mexico and Arizona. Bot. Gaz. **6:** 183–185. 1881.
Four of these from New Mexico.

——— On the colors of some western flowers. . Bot. Gaz. **6:** 198. 1881.

——— New plants from New Mexico and Arizona. Bot. Gaz. **6:** 217–219. 1881.
Five new species from New Mexico.

——— New species of plants, chiefly New Mexican. Bull. Torrey Club **8:** 97–99. 1881.
Five new species from New Mexico.

——— New species of plants, chiefly New Mexican. Bull. Torrey Club **8:** 121–123. 1881.
Six new species described from New Mexico.

**Greene**, E. L. New western plants. Bull. Torrey Club. **9:** 62–65. 1882.
Four of the new species New Mexican.

——— New plants. Bull. Torrey Club **10:** 41–42. 1883.
Including *Artemisia franserioides* from New Mexico.

——— Enumeration of the North American Loti. Pittonia **2:** 133–150. 1890.
*Lotus neomexicanus* described from New Mexico.

——— [Note on *Agave parryi* in New Mexico.] Erythea **1:** 52. 1893.

——— Another bad guess at a name. Erythea **1:** 143–144. 1893.
Reference to *Rumex hymenosepalus*.

——— Some species of Dodecatheon. Erythea **3:** 37–40. 1890.
*Dodecatheon radicatum* new from New Mexico.

——— New or noteworthy species. XV. Pittonia **3:** 13–28. 1896.
*Eriogonum densum* and *Rhamnus betulaefolia* included as new.

——— New or noteworthy species. XIX. Pittonia **3:** 212–230. 1897.
*Trifolium fendleri* of New Mexico included as new.

——— New Compositae from New Mexico. Bull. Torrey Club **25:** 117–124. *pl. 330–334*. 1898.
Sixteen new species and one new subspecies described from the collections made by Prof. E. O. Wooton in 1897.

——— Studies in the Compositae. VII. Pittonia **3:** 264–298. 1898.
Three new species described from New Mexico.

——— New or noteworthy species. XXIII. Pittonia **3:** 343–349. 1898.
Three new species described from New Mexico.

——— New western species of Rosa. Pittonia **4:** 10–14. 1899.
*Rosa suffulta* described from northern New Mexico.

——— New choripetalous exogens. Pittonia **4:** 14–21. 1899.
Three new species of Draba described from New Mexico.

——— A decade of new Gutierrezias. Pittonia **4:** 53–58. 1899.
Five of them from New Mexico.

——— New or noteworthy species. XXIV. Pittonia **4:** 68–72. 1899.
*Argemone squarrosa* and *Lesquerella valida* included as new.

——— West American Asperifoliae. IV. Pittonia **4:** 86–97. 1899.
Two new species from New Mexico.

——— New or noteworthy species. XXVI. Pittonia **4:** 98–101. 1899.
New Mexican collections mentioned.

——— A fascicle of new Senecios. Pittonia **4:** 108–124. 1900.
Contains notes on *Senecio fendleri* of New Mexico.

——— A decade of new Pomaceae. Pittonia **4:** 127–131. 1900.
Two new species described in Amelanchier and one in Sorbus.

——— A fascicle of new Papilionaceae. Pittonia **4:** 132–139. 1900.
Five new species from New Mexico.

——— New or noteworthy species. XXVII. Pittonia **4:** 146–158. 1900.
Three new species from New Mexico.

——— A decade of new Gentianaceae. Pittonia **4:** 180–186. 1900.
*Frasera venosa* described from New Mexico.

——— Studies in the Cruciferae. III. Pittonia **4:** 187–207. 1900.
New species from New Mexico under Arabis and Cheiranthus.

——— New or noteworthy species. XXVIII. Pittonia **4:** 233–241. 1901.
Four new species described from New Mexico.

——— New species of Cerastium. Pittonia **4:** 297–304. 1901.
One of them based, partly at least, on New Mexican material.

——— New or noteworthy species. XXIX. Pittonia **4:** 318–320. 1901.
*Erigeron setulosus* new from New Mexico.

——— New or critical species of Acer. Pittonia **5:** 1–4. 1902.
*Acer neomexicanum* described from New Mexico.

**Greene**, E. L. Segregates of *Viola canadensis*. Pittonia **5:** 24–29. 1902.
*Viola neomexicana* described.

——— A fascicle of new Compositae. Pittonia **5:** 55–64. 1902.
*Thelesperma formosum* and *Chrysothamnus confinis*, New Mexican species.

——— New species of Apocynum. Pittonia **5:** 64–66. 1902.
*Apocynum laurinum* New Mexican.

——— North American species of Amarella. Leaflets **1:** 53–56. 1904.
*Amarella revoluta* and *A. cobrensis* from New Mexico.

——— Some western buckthorns. Leaflets **1:** 63–65. 1904.
Two new species of Rhamnus from New Mexico.

——— New species of Ceanothus. Leaflets **1:** 65–68. 1904.
Includes *Ceanothus mogollonicus* from New Mexico.

——— Two new Sophiae. Leaflets **1:** 96. 1904.
*Sophia obtusa* and *S. serrata*, both New Mexican.

——— Three new Heucheras. Leaflets **1:** 111–112. 1905.
Two of them from New Mexico.

——— Segregates of the genus Rhus. Leaflets **1:** 114–144. 1905.
Three new species from New Mexico.

——— New plants from southwestern mountains. Leaflets **1:** 145–154. 1905.
Numerous new species described from New Mexico.

——— New species of Chaptalia. Leaflets **1:** 158. 1905.
*Chaptalia alsophila* from New Mexico.

——— New or noteworthy species. Leaflets **1:** 199–200. 1905.
*Dalea urceolata* new from New Mexico.

——— Some west American red cherries. Proc. Biol. Soc. Washington **18:** 55–60. 1905.
*Cerasus crenulata* new from New Mexico.

——— New plants from New Mexico. Leaflets **1:** 211–214. 1906.
Eight new species described.

——— Four streptanthoid genera. Leaflets **1:** 224–229. 1906.
Two species of Disaccanthus described from New Mexico.

——— The genus Ptelea in the western and southwestern States and Mexico. Contr. Nat. Herb. **10:** 49–78. 1906.
Six new species from New Mexico.

——— A study of *Rhus glabra*. Proc. Washington Acad. Sci. **8:** 167–196. 1906.
*Rhus sorbifolia* described from northern New Mexico.

——— *Argemone pleiacantha*. Repert. Nov. Sp. Fedde **6:** 161. 1908.
A new species from New Mexico.

——— New species of the genus Mimulus. Leaflets **2:** 1–8. 1909.
*Mimulus cordatus* described from New Mexico.

——— New western Asteraceae. Leaflets **2:** 8–13. 1909.
*Pyrrocoma amplectens* new from New Mexico.

——— Novitates Boreali-Americanae. III. Species novae generis Aconiti. Repert. Nov. Sp. Fedde **7:** 1–6. 1909.
Two from New Mexico.

——— Novitates Boreali-Americanae. IV. Repert. Nov. Sp. Fedde **7:** 195–197. 1909.
Describes two New Mexican species of Gutierrezia.

——— Three new Eriogonums, Muhlenbergia **6:** 1–3. 1910.
Two of them from New Mexico.

——— Three new Astragali. Leaflets **2:** 42–3. 1910.
One new species from New Mexico.

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*Rosa mirifica* described from New Mexico.

**Greene,** E. L. Studies of Thalictraceae. II. Leaflets **2:** 89–94. 1910.
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**Greenman,** J. M. *See* Robinson, B. L.

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Includes notes upon some from New Mexico.

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**Heimerl,** Anton. Studien über einige Nyctaginaceen des Herbarium Delessert. Ann. Cons. Jard. Genève **5:** 177–197. 1901.
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——— Two botanists in New Mexico. Plant World **1:** 21–24. 1897.
An account of Professor and Mrs. Heller's collecting trip in northern New Mexico in 1897.

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Three new species described.

——— New plants from western North America. I. Bull. Torrey Club **25:** 193–201. pl. 338–340. 1898.
Six new species from New Mexico.

——— New and interesting plants from western North America. IV. Bull. Torrey Club **25:** 626–629. 1898.
*Linum australe* described from New Mexico.

——— New and interesting plants from western North America. VI. Bull. Torrey Club **26:** 547–552. 1899.
*Aragallus pinetorum* and *Mertensia pratensis* new species from New Mexico.

——— New and interesting plants from western North America. VII. Bull. Torrey Club **26:** 588–593. 1899.
New Mexican localities mentioned for several new species.

——— New and interesting plants from western North America. VIII. Bull. Torrey Club **26:** 621–627. 1899.
Three new Drabas from New Mexico described.

**Hough,** Myrtle Zuck. Plant names of the southwestern United States. Plant World **3:** 137–139. 1900.
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**Johnston,** J. R. A revision of the genus Flaveria. Proc. Amer. Acad. **39:** 279–292. 1903.

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**Jones,** Marcus E. Contributions to western botany. No. 3. Zoe **3:** 283-309. 1893.

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——— Contributions to western botany. No. 4. Zoe **4:** 22–54. 1893.

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——— Contributions to western botany. No. 8. 43 p. 1898.

Two new species of Astragalus from New Mexico.

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The material upon which the work was based came from southern New Mexico.

**Liebmann,** F. M. [Without title.] Overs. Dansk. Vidensk. Selsk. Forh. **1854:** 170. 1854.

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**Mackenzie,** K. K. Notes on Carex. II. Bull. Torrey Club **34:** 151–155. 1907.

*Carex neomexicana* described from New Mexico.

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**Mearns,** E. A. Mammals of the Mexican Boundary of the United States. A descriptive catalogue of the species of mammals occurring in that region, with a general summary of the natural history, and a list of trees. U. S. Nat. Mus. Bull. **56:** 1–530. 1907.

Many of the trees listed are from New Mexican localities, some of them species not before reported from the Territory.

**Merrill,** Elmer D. *Aristida purpurea* Nutt. and its allies. U. S. Dep. Agr. Div. Agrost. Circ. **34:** 1–8. 1901.

Numerous references to New Mexican specimens.

**Metcalfe,** O. B. The flora of the Mesilla Valley. Thesis for the degree of B. S., New Mexico Agricultural College. MS. in library N. Mex. Agr. Coll.

A discussion of the zones of plant life to be found in the region, together with a list of the plants occurring in the vicinity.

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*Andropogon neomexicanus* and *Sporobolus giganteus* described from southern New Mexico.

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*Malvastrum cockerellii* described from New Mexico.

——— Two new plants from New Mexico. Proc. Biol. Soc. Washington **16**: 29–30. 1903.

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**Nelson**, Elias. Revision of the North American Phloxes. Ann. Rep. Wyo. Agr. Coll. **9**: 1–36. 1899.

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**Parry**, C. C. Introduction to the Botany of the Mexican Boundary, p. 9–26. 1859.

——— A list of plants collected by C. Thomas, in eastern Colorado and northeastern New Mexico, during the survey of 1869. Ann. Rep. U. S. Geol. Surv. **4**: 484–487.

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**Pollard**, C. L., and Cockerell, T. D. A. Four new plants from New Mexico. Proc. Biol. Soc. Washington **15**: 177–179. 1902.

**Pound,** Roscoe, and Clements, F. E. The vegetation regions of the prairie province. Bot. Gaz. **25:** 381–394. 1898.

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———, and Painter, J. H. Some Mexican species of Cracca, Parosela, and Meibomia. Bot. Gaz. **40:** 143–146. 1905.

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Notes on observations made in New Mexico.

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——— A biographical sketch of Dr. George Thurber. Bull. Torrey Club **17:** 204–210. 1890.

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——— Notes on Potentilla. V. Bull. Torrey Club **23:** 429–435. 1895.

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——— Studies on the Rocky Mountain flora. V. Bull. Torrey Club **28:** 266–284. 1901.

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*Corispermum marginale* described from New Mexico.

——— Studies on the Rocky Mountain flora. XII. Bull. Torrey Club **31:** 555–575. 1904.

*Pseudocymopterus montanus multifidus* described from New Mexico.

——— Studies on the Rocky Mountain flora. XIII. Bull. Torrey Club **31:** 631–665. 1904.

New species from New Mexico described under Gutierrezia and Chrysothamnus.

——— Studies on the Rocky Mountain flora. XIV. Bull. Torrey Club **32:** 123–138. 1905.

*Tetraneuris angustifolia* described from New Mexico.

——— Saxifragaceae. N. Amer. Fl. **22**[2]**:** 110. 1905.

Descriptions of three new species of Heuchera.

——— Flora of Colorado. Colo. Agr. Exp. Sta. Bull. **100:** 1–448. 1906.

Contains a large part of the species of northern New Mexico.[a]

**Sargent,** C. S. Report on the forests of North America (exclusive of Mexico). 612 p. Washington, 1884. 10th Census Rep. [v. 9].

The forests of New Mexico are treated specifically on p. 568, where there is a small map showing their distribution. There are also notes elsewhere in the report.

**Schumann,** Karl. Gesamtbeschreibung der Kakteen. 832 p. Neudamm, 1897–1899.

Contains many references to New Mexican material and localities, the most of them copied from Coulter.

**Scribner,** F. Lamson-. New North American grasses. Bull. Torrey Club **11:** 5–7. 1884.

Includes an unpublished description by Thurber of *Bouteloua trifida* from New Mexico and Arizona.

——— *See also* Vasey, George.

**Scribner,** F. Lamson-, and Merrill, Elmer D. The North American species of Chaetochloa. U. S. Dep. Agr. Div. Agrost. Bull. **21:** 1–44. 1900.

*Chaetochloa grisebachii ampla* described from the Organ Mountains.

**Shear,** C. L. A revision of the North American species of Bromus occurring north of Mexico. U. S. Dept. Agr. Div. Agrost. Bull. **9:** 116–175. 1894.

*Bromus porteri frondosus* described from New Mexico.

**Sheldon,** E. P. A preliminary list of the North American species of Astragalus. Minn. Bot. Stud. **1:** 116–175. 1894.

Three new species from New Mexico.

**Small,** John K. New and interesting species of Polygonum. Bull. Torrey Club **21:** 168–173. 1894.

*Polygonum longistylum* from New Mexico.

——— Oenothera and its segregates. Bull. Torrey Club **23:** 167–194. 1896.

*Anogra neomericana* described from New Mexico.

——— Notes and descriptions of North American plants. I. Bull. Torrey Club **25:** 316–320. 1898.

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——— Oxalidaceae. N. Amer. Fl. **25**[2]**:** 25–58. 1907.

Three new species of Ionoxalis described from New Mexico.

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[a] Much the same may be said of this as of Coulter's Botany of Western Texas. Rydberg's Flora, however, is more useful in the northern part of New Mexico than Coulter's in the southern part, being newer and more complete. The relation between the flora of northern New Mexico and that of southern Colorado, too, is possibly closer than that existing between those of southern New Mexico and western Texas. Almost all the plants occurring in the Santa Fe and Las Vegas mountains and the surrounding region will be found listed in the Flora of Colorado.

**Smith,** J. G. **A synopsis** of the genus Sitanion. U. S. Dept. Agr. Div. Agrost. Bull. **18:** 1–21. pl. 1–4. 1899.

*Sitanion caespitosum* described from New Mexico.

——— Grazing problems in the southwest and how to meet them. U. S. Dept. Agr. Div. Agrost. Bull. **16:** 1–47. 1899.

Considerable discussion of New Mexican plants contained in the paper.

**Spalding,** V. M. Notes on the vegetation of Cox Cañon. Plant World **10:** 11–17. 1907.

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**Standley,** P. C. *See also* Wooton, E. O.

——— A statistical study of *Echinocereus polyacanthus* Engelm. and its nearest allies as represented by plants growing near the Agricultural College. Thesis, New Mexico Agricultural College. MS. in library of the College.

A synopsis of this thesis is published in the following paper.

——— Some Echinocerei of New Mexico. Bull. Torrey Club **35:** 77–88. 1908.

*Echinocereus neomexicanus* described as new.

——— Notes on the flora of the Pecos River National Forest. Muhlenbergia **5:** 17–30. 1909.

*Erigeron pecosensis* and *Ratibida tagetes cinerea* described as new.

——— A witch's broom of the desert. Plant World **13:** 61–63. 1909.

An account of an Aecidum on *Ephedra trifurca*.

——— The Allioniaceae of the United States, with notes on Mexican species. Contr. Nat. Herb. **12:** 303–389. pl. 28–43. 1909.

Several new species described from New Mexico, besides many references to New Mexican specimens.

——— More southwestern Castillejas. Muhlenbergia **5:** 81–87. 1909.

*Castilleja inconstans*, *C. organorum*, and *C. wootonii* from New Mexico described as new.

——— The type localities of plants first described from New Mexico. Contr. Nat. Herb. **13:** 143–227. 1910.

**Steel,** Matthew. The ash analyses of some New Mexico plants. Thesis for the degree of M. S., New Mexico Agricultural College. MS. in library of the College.

**Sudworth,** George B. Forest flora of the Rocky Mountain region. U. S. Dept. Agr. For. Div. Bull. **2:** 153–197. 1889.

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——— A new tree juniper from New Mexico. Forestry & Irrigation **13:** 307–310. 1907.

*Juniperus megalocarpa* described as new.

**Sutherland,** Wm. A. A study in transpiration. Thesis, New Mexico Agricultural College. MS. in library of the College.

The experiments the results of which are described were performed with plants found in southern New Mexico.

**Sweet,** Lottie. A study of the form and distribution of the stomata on the stem and leaves of *Lesquerella fendleri* Wats., *Dithyraea wislizeni* Engelm., and *Medicago sativa* L. Thesis, New Mexico Agricultural College. MS. in library of the College.

**Thurber,** George. *See* note under Scribner, F. Lamson-.

**Torrey,** John. Botany. *In* Sitgreaves, Rep. Zuni & Colo. 155–178. pl. 1–20. 1853.

Several new plants described from New Mexico.

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Several new species from New Mexico.

**Torrey,** John. [Report upon the plants collected by Lieutenant Abert]. *In* Emory, Mil. Recon. 406–414. 1848.
New Mexican localities cited for numerous plants.

——— Description of the general botanical collections [of Whipple's Expedition]. Pac. R. Rep. **4**[5]: 59–167. pl. 1–25. 1856.
Includes many notes upon the flora of New Mexico.

——— Botanical report: Routes in California to connect with the routes near the thirty-fifth and thirty-second parallels, and route near the thirty-second parallel, between the Rio Grande and Pimas villages, explored by Lieut. John G. Parke, corps of topographical engineers, in 1854 and 1855. p. 1–28. pl. 1–8. 1856.
Two new species described from New Mexico.

——— Botany of the Boundary. *In* Bot. Mex. Bound., i. e., *in* Emory, U. S. and Mex. Bound. Surv. **2**[1][a]: 27–270. pl. 1–61. 1859.
Several new species described from New Mexico.

**Torrey,** John, and Gray, Asa. Report on the Botany of the Expedition [Pope]. Pac. R. Rep. **2**[2]: 159–184. pl. 1–10. 1855.

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Report upon observations made in southern New Mexico.

——— On the life zones of the Organ Mountains and adjacent region in southern New Mexico, with notes on the fauna of the range. Science, n. ser. **22:** 313–315.

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——— On the biogeography of Mexico and the southwestern United States. Trans. Tex. Acad. Sci. **2**[1]: 33–86. 1897.

**Tracy,** S. M. Report of an investigation of the grasses of the arid districts of Texas, New Mexico, Arizona, Nevada, and Utah. 1887. p. 1–61. pl. 1–30.

**Trelease,** William. The Yucceae. Rep. Mo. Bot. Gard. **13:** 27–133. pl. 1–99. 1902.
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**Uline,** E. B., and Bray, William L. A preliminary synopsis of the North American species of Amaranthus. Bot. Gaz. **19:** 267–272, 311–320. 1894.
Two new species described from New Mexico.

**Underwood,** L. M. *Selaginella rupestris* and its allies. Bull. Torrey Club **25:** 125–133. 1898.
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New Mexican material cited.

——— A new Adiantum from New Mexico. Bull. Torrey Club **28:** 46–47. 1901.
*Adiantum modestum* described as new.

**Vail,** Anna Murray. An undescribed species of Kallstroemia from New Mexico. Bull. Torrey Club **24:** 206–207. 1897.
*Kallstroemia brachystylis* described.

——— Studies in the Asclepiadaceae. III. Bull. Torrey Club **25:** 171–182. 1898.
*Asclepias scaposa* new from New Mexico.

——— *In* Small, Fl. Southeast. U. S. 670. 1903.
*Kallstroemia hirsutissima* described from New Mexico.

**Vasey,** George. *In* Scribner, New North American grasses. Bull. Torrey Club **11:** 5–7. 1884.
*Bouteloua pusilla* new from New Mexico.

——— New grasses. Bull. Torrey Club **11:** 125–126. 1884.
*Stipa scribneri* described from New Mexico.

**Vasey,** George. Report of an investigation of the grasses of the arid districts of Kansas, Nebraska, and Colorado. U. S. Dept. Agr. Div. Bot. Bull. **1:** 1–18. 1886.
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——— New grasses. Bot. Gaz. **11:** 337–338. 1886.
Two new species of Muhlenbergia from New Mexico.

——— Grasses of the Southwest. U. S. Dept. Agr. Div. Bot. Bull. **12:** 1–7. pl. 1–50. 1890.
Contains notes upon New Mexican species.

——— Description of new or noteworthy grasses from the United States. Contr. Nat. Herb. **1:** 267–280. 1893.
Three new species of Poa described from New Mexico.

**Watson,** J. R. Manual of the more common flowering plants growing without cultivation in Bernalillo County, New Mexico. Bull. Univ. N. Mex. **49:** 1–107. 1908.

**Watson,** Sereno. Revision of the North American Chenopodiaceae. Proc. Amer. Acad. **9:** 82–126. 1874.
Several new species described from New Mexico.

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——— Descriptions of some new species of plants, chiefly from our western territories. **20:** 353–378. 1885.
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**Wheelock,** Wm. E. A descriptive list of species of the genus Heuchera. Bull. Torrey Club **17:** 191–204. 1890.
*Heuchera novomericana* new from New Mexico.

**White,** V. S. The Tylostomaceae of the United States. Bull. Torrey Club **28:** 421–443. pl. 31–40. 1901.
*Tylostoma gracile* new from New Mexico.

**Wiegand,** Karl M. *Juncus tenuis* Willd. and some of its North American allies. Bull. Torrey Club **27:** 511–527. 1900.
*Juncus arizonicus* new from New Mexico.

**Wilson,** Guy West. Studies in North American Peronosporales. III. New or noteworthy species. Bull. Torrey Club **35:** 361–365. 1908.
One new species from New Mexico.

**Wislizenus,** A. Memoir of a tour to northern Mexico, connected with Colonel Doniphan's expedition, in 1846 and 1847. 141 p. Washington, 1848.
Contains numerous notes on the botanical features of the route through New Mexico.

**Woodhouse,** S. W. Report on the natural history of the country passed over . . . In Sitgreaves, Rep. Zuni & Colo. 33–40. 1853.
Contains a report upon the botanical features of western New Mexico.

**Wooton,** E. O. New Mexico weeds. No. 1. N. Mex. Agr. Exp. Sta. Bull. **13:** 1–36. 1894.
Notes upon the economic importance of various weeds of the Territory.

——— The Russian thistle. N. Mex. Agr. Exp. Sta. Bull. **15:** 1–20. 1895.
A report of its occurrence in New Mexico.

——— Some New Mexico forage plants. N. Mex. Agr. Exp. Sta. Bull. **18:** 57–95. 1896.
A discussion of the economic use of native forage plants.

——— A new southwestern rose. Bull. Torrey Club **25:** 152–154. pl. 335. 1898.
*Rosa stellata* described, from New Mexico.

——— New plants from New Mexico. Bull. Torrey Club **25:** 257–264, 304–310, 451–459. 1898.
Twenty-three new species and one subspecies described.

**Wooton,** E. O. Range grasses of New Mexico. Rep. Gov. New Mex. **1902:** 232–234. 1903. (Abridged from N. Mex. Agr. Exp. Sta. Bull. **18.**)

——— The ferns of the Organ Mountains. Torreya **3:** 161–164. 1903.
An annotated list of those reported from this range.

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——— Southwestern localities visited by Charles Wright. Bull. Torrey Club **33:** 561–566. 1906.
A description of the routes followed by this collector in the Southwest.

——— The range problem in New Mexico. N. Mex. Agr. Exp. Sta. Bull. **66:** 1–46. 1908.
Contains many notes upon the occurrence of native plants, besides a map showing the distribution of grass societies in the Territory.

——— The larkspurs of New Mexico. Bull. Torrey Club **37:** 31–41. 1910.
Five new species of Delphinium described.

**Wooton,** E. O., and Rydberg, P. A. Mem. Dep. Bot. Columbia Univ. **2:** 57. 1898.
Description of *Potentilla sierraeblancae,* from New Mexico.

**Wooton,** E. O., and Standley, Paul C. The genus Androsace in New Mexico. Bull. Torrey Club **34:** 517–520. 1907.
Two new species described.

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Longitude West 108° from Greenwich

UTAH

COLORADO

OKLAHOMA

KANSAS

TEXAS

SAN JUAN

RIO ARRIBA

TAOS

COLFAX

UNION

MORA

MCKINLEY

SANDOVAL

SANTA FE

SAN MIGUEL

VALENCIA

TORRANCE

GUADALUPE

CURRY

ROOSEVELT

SOCORRO

LINCOLN

CHAVES

CATRON

SIERRA

OTERO

EDDY

LUNA

DONA ANA

HIDALGO

NAVAJO INDIAN RESERVATION

CHACO CANYON N.M.

CARSON NATIONAL FOREST

SANGRE DE CRISTO GRANT

MAXWELL GRANT

LAS VEGAS GRANT

PADILLA GRANT

ANTONIO ORTIZ GRANT

PRESTON BECK GRANT

ANTON CHICO GRANT

PEDRO ARMENDARIS GRANT

TOWN OF ATRISCO GRANT

TOWN OF ALAMEDA GRANT

TOME GRANT

SEVILLETA GRANT

LINCOLN NATIONAL FOREST

MESCALERO APACHE INDIAN RESERVATION

ALAMO NATIONAL FOREST

GILA NATIONAL FOREST

DATIL NATIONAL FOREST

ZUNI INDIAN RESERVATION

MIMBRES

STAKED PLAINS

LEGEND

- Capitol (Santa Fe)
- County Seats
- County Boundaries
- Cities, Towns, Settlements etc.
- Type Locality
- Land District Boundaries
- Townships not subdivided into sections
- Forest Reserves
- Indian Reserves
- Military Reserves
- Private Land Grants

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
CONTRIBUTIONS FROM THE NATIONAL HERBARIUM, VOL. XIII

REDUCED REPRODUCTION OF MAP OF

# TERRITORY OF NEW MEXICO

Compiled from the official Records of the General Land Office and other sources

1910

Scale of Miles.

Longitude West 29° from Washington

Drawn and Lettered by A.F. Pressnell

THE ECKERT LITHOGRAPHING CO. WASHINGTON, D. C.

SMITHSONIAN INSTITUTION

UNITED STATES NATIONAL MUSEUM

# CONTRIBUTIONS

FROM THE

# UNITED STATES NATIONAL HERBARIUM

VOLUME 13, PART 7

# A PRELIMINARY TREATMENT OF THE GENUS CASTILLA

By HENRY PITTIER




WASHINGTON
GOVERNMENT PRINTING OFFICE
1910

BULLETIN OF THE UNITED STATES NATIONAL MUSEUM

Issued December 31, 1910.

# PREFACE.

Investigations made by the United States Department of Agriculture during the last ten years have shown that the Central American rubber tree is not, as generally accepted, a homogeneous species, but that it consists of several well characterized forms which differ materially in their geographic distribution and climatic correlation. Hitherto rubber planters have made no distinction between these forms, and many of the unsuccessful attempts at the cultivation of Castilla as a rubber-producing tree may be traced to the want of discrimination in the choice of the form from which the seeds were taken.

In the present paper, by Mr. Henry Pittier, an attempt has been made to describe systematically these various forms, along the lines indicated in a former paper by Mr. O. F. Cook. Although Mr. Pittier has brought to this work a long practical experience in the field, and has had an abundant supply of material for study, our knowledge of the various forms will still be far from complete. Their number may be reduced or increased and their relative status altered. Nevertheless, the present paper will remain as the first attempt at a thorough study of the group.

In recent years new species have been discovered in South America, and the areal limits of the genus have thus been extended far beyond the Isthmus to Bolivia and eastern Brazil. It is almost certain that other species, hitherto hidden in the unexplored forests of South America, will come to fill the gaps in the distribution of the genus.

FREDERICK V. COVILLE,
*Curator of the United States National Herbarium.*

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# A PRELIMINARY TREATMENT OF THE GENUS CASTILLA.

By Henry Pittier.

## INTRODUCTION.

### ESTABLISHMENT OF THE GENUS.

The genus Castilla was proposed and described for the first time in an inaugural lecture on botany given at the Royal Botanic Garden of Mexico City June 22, 1793, by the titular professor Vicente Cervantes. The text of the lecture was subsequently printed, and the plant figured, in a supplement to the "Gaceta de Literatura," this being the way in which one of Cervantes' few contributions to botany has come down to the present generation.[a]

After mentioning the old Nanuatl name "holguahuitl," and the half-Spanish one of "arbol del hule," under which the Mexican rubber tree was then known, Cervantes provides it, according to the then dogmatically applied Linnæan rules, with Latin generic and specific names. The generic name is Castilla, the tree being dedicated as a testimony of "just gratitude for the friendship" and the meritorious work of the major pharmacist and economic explorer, Juan del Castillo (1744–1793). The specific name *elastica* refers to the remarkable property of the gum contained in the latex.

Cervantes's description is far from perfect and its deficiencies were noted even by his contemporaries, as is shown in the "Notas y descripcion que hace un imparcial aficionado á la botánica, para aclarar los defectos de la que leyó el catedrático D. Vicente Cervantes, etc." The author of this document, who signs with his initials only (J. L. M.)

[a] A native of the province of Extremadura (Spain) and a disciple of C. Gomez Ortega, Cervantes went to Mexico in 1786 to fill the newly created and first chair of botany in the vice-kingdom of New Spain. The best Mexican botanists of the time, among them Mociño and Maldonado, number among his pupils. For eighteen years he also superintended the pharmacy of the San Andrés Hospital, devoting special attention to the medicinal properties of the plants. He died at Mexico City July 26, 1829, at the age of 70. See also N. León, Biblioteca bot.-mexicana, p. 88.

objects to both the generic and specific names, the first on account of the Linnæan aphorism 134: "Nomina quae ex graeca, vel latina lingua radicem non habent, rejicienda sunt," and the second as being useless, since there is only one species in the genus. In a further communication [a] the same critic explains how, in forming the generic name, the first step should have been to latinize the name "Castillo," making it "Castellum," from which "Castella," and not "Castilla," would be the right derivative. From our present standpoint the dispute is rather a puerile one, as is also the lengthy dissertation on the superfluity of the specific name. Though the latter would in any case be required, as a matter of fact the genus is widespread and contains several species.[b] "Castilla" is certainly as good a generic name as any and its rejection is not justified, although it was changed and practically dropped less than ten years after its publication in Mexico. In 1805, in a translation of the original memoir published in London as one of the "Tracts relative to botany," Cervantes's name became "Castilloa," and no reason seems to have ever been given for the intercalation of the additional vowel. It may be the result of a slip of the pen or of the officious but ignorant interference of the translator, or it is perhaps a simple typographic mistake. In 1903 Mr. O. F. Cook [c] called attention to the change, which he rightly denounces as "justified by no recognized rule of botanical nomenclature." But botanists at large, and even those who are most strict in enforcing the laws of priority, have concurred in the maintenance of a name which has hardly a claim to be considered even as a synonym.

The description given by Cervantes is very vague; it might apply to any of the known species, and even to other genera of the same family. From the gross exaggerations it contains with reference to the size of the tree, it might be inferred that the author had never seen a standing specimen of the latter. Nevertheless, it seems evident that the species he had in mind was the one growing "en las jurisdicciones de la antigua Veracruz, Cosamaluapan y Acayucan," all three of which are in the State of Veracruz of to-day, and include probably the

---

[a] Carta del aficionado de la botánica J. L. M., contestando al impreso del catedrático de ella de 14 de Noviembre de 1794, op. cit.

[b] The "Notas" also contain curious considerations that give an idea of the advancement of plant anatomy at the end of the 18th century. Cervantes, namely, had called the receptacular involucrum of the male inflorescence a calyx, whereas J. L. M. denominates it a *corolla monopetala*. "El caliz," he says, "tiene su origen de la corteza de la planta, la corola del liber, los estambres del leño, y el pistilo de la médula;" wherefrom it is logically deduced that the stamens being attached to the perianth, this is bound to be a corolla, having its origin in the liber, etc.

[c] Cook, O. F. The Culture of the Central American Rubber Tree. U. S. Dept. Agr. Bur. Plant Ind. Bull. 49, p. 19. 1903.

locality of Motzorongo, whence proceed the samples which are described here as belonging to the typical *Castilla elastica*. Cervantes's critic, J. L. M., also cites the "Departamento de San Blas" as a locality where the Castilla trees are especially numerous. If this is the San Blas of Tepic, it is also the northernmost recorded station of the genus on the Pacific coast, but it is by no means certain that the species found there is identical with the one from the opposite coast.

## HISTORY OF SPECIES HITHERTO KNOWN.

For more than half a century after its establishment by Cervantes the genus Castilla was considered as monotypic, and all specimens met with from Mexico to Peru were referred to his single species *C. elastica*. Every mention of the rubber trees of the region, also, assumed that there was only the one species. Even to-day, at a time when this genus has acquired a considerable importance as a rubber producer, we find in most treatises and reviews dealing with the economic features of the rubber question the obsolete notion that one of its main sources is *Castilla elastica*, from Central and South America.

In 1851, however, Liebmann published his *C. costaricana*, founded on incomplete specimens collected by Oersted at Turrialba. Liebmann had familiarized himself with the Mexican species, which he had observed and collected at no less than six different localities in the State of Veracruz,[a] and notwithstanding the few and unsatisfactory differential characters presented by the leaves, he did not hesitate to assign Oersted's material to a distinct species.

Thus far *Castilla elastica* had not attracted much attention as an economic tree, but 25 years later rubber exportation from Central America had attained its full swing, and it became more and more urgent to acquire a better knowledge of the sources of supply. In 1800 Cavanilles had reported the presence on the Isthmus of Panama of a rubber tree which he identified with Cervantes's species and the existence of which was confirmed in the fifties by Sutton Hayes, botanical explorer of the route between Panama and Colon. In connection with this information of Cavanilles and Hayes, which later reports and actual experience have shown to be well founded, there should be mentioned here the singular mistake made by James Collins,[b] describing and figuring as "ule-ule," or "Panama rubber," under the name of "*Castilloa markhamiana*," specimens of a Perebea collected by Hayes on the Isthmus. The description, and especially the very good illustration accompanying Collins's report, leave scarcely a doubt as to the identity of the small tree, as has already been acknowledged by Hooker and other authorities.

---

[a] Dansk. Vid. Selsk. Skr. V. **2**: 318. 1851.

[b] Report on Caoutchouc of Commerce, p. 12. (1872.)

On the strength of the above information, Robert Cross was detailed to Panama in 1875, by the India Office, to study the tree on the spot and to gather seeds and seedlings for distribution to the British colonies possessing suitable soil and proper climatic conditions. In this way the Central American rubber trees became better known and were introduced into Ceylon, India, and the West Indies. Materials for study began to arrive at Kew, and on December 3, 1885, Sir Joseph Dalton Hooker read before the Linnean Society a memoir "On the *Castilloa elastica* Cervantes and some allied rubber-yielding plants," in which he admitted the probable existence of more than one species of Castilla and insisted on the necessity of a more accurate study of the genus. In this paper, however, he reduced *C. costaricana* Liebm., cited erroneously as "*C. costa-ricensis*," to the rank of a synonym of *C. elastica*, a step that must be considered a retrograde one and justified only by the evident lack of authentic information. Although short descriptions and good illustrations were given, Hooker made no attempt toward establishing any new species.

In recent years, the now adult trees introduced everywhere in the Tropical Zone in botanical gardens and at agricultural stations have been widely experimented upon with varying results and a large amount of capital has been invested in plantations, most of which have failed thus far to justify the oversanguine expectations of the investors. The lack of uniformity in the behavior of the tree under cultural conditions, has awakened a suspicion of specific diversity, but the absence of adequate specimens in the botanical collections has defeated the efforts of most investigators to reach a conclusion as to whether Castilla is or is not a monotypic genus.

In 1900, however, Mr. Hemsley advanced toward the solution of the question by publishing his *C. tunu*, unfortunately founded upon specifically heterogeneous materials, to which he added the following year *C. australis*, growing at the southernmost limit of the generic area.

But the real investigation of the Central American species of Castilla began in 1902, when Mr. O. F. Cook went to southern Mexico expressly to further our knowledge of rubber-producing plants and the possibilities of their systematic cultivation. In 1903 he published in a memoir full of original views and of useful hints the results of his first researches, and these were actively continued during the subsequent years and extended to Guatemala and Costa Rica. In the course of his travels, Mr. Cook lost no opportunity to secure complete material, preserved in alcohol, so as to make possible a thorough study of the anatomical and structural features of the several parts. In 1905, he was able to publish a good synopsis of the characters of no less than seven species, of which four were new and

detached from the original *C. elastica*. Mr. G. N. Collins not only collaborated with Mr. Cook in all his researches, but contributed on several other occasions to the increase of the alcoholic collection of specimens. The present writer had also his modest share of the field work. Mention should also be made here of a fine set of natural-size photographs, made mainly by Mr. C. B. Doyle under the direction of Mr. Cook. This collection is unique of its kind and affords ample and conclusive evidence bearing upon the identification of the several species.

These are the antecedents that have led the writer to undertake the present monograph of the genus Castilla, as a preliminary step to the study of questions relating to the availability of the species as rubber producers. The detailed investigation of the above-mentioned material not only established the value of Mr. Cook's species, but led to the segregation of an additional Central American form. Besides these, a new species was discovered by the writer in Colombia, and the well-known German explorer, Doctor Ule, identified as a Castilla one of the Brazilian rubber trees, the number of species described in the present paper thus becoming ten. On the other hand, it has not been possible to take into serious consideration certain proposed new species, as, for instance, *C. alba*, *C. nigra*, and *C. rubra* of Koschny, that are mere physiological accidents, the results mostly of differences in light and soil conditions. This has been clearly shown by Mr. Cook's investigations in Costa Rica and by careful examination of the specimens.

## GENERAL CHARACTERS AND THEIR SYSTEMATIC VALUE.

### HABIT.

When fully developed, all species of Castilla are trees of large size and of striking habit. As noticed by Mr. Cook, they are seldom true forest trees, but they also avoid the open grass-covered savanna. Their natural habitat is in the clearings and other open spots of the virgin forest, where they are generally found in company with Cecropia, or in the fertile, sparsely wooded alluvial flats of the valley bottoms.

### ROOTS.

In these rubber trees the root system consists of a rather short tap root and of several lateral roots spreading horizontally and so near the surface of the soil that they can often be followed for 20 to 30 meters. This disposition is very adverse to the cultivation of the tree in pastures, because the treading of the cattle often damages the trees beyond recovery. In the flat, shady forest the roots often assume a buttress-like shape at their emergence from the main axis. These

wing-like formations were particularly conspicuous on the giant specimens of *C. daguensis* observed by the writer between Córdoba and San José, in the Dagua Valley (Cauca-Colombia). They are also reported as often present at the base of the trunks of *C. costaricana*, in the plains of San Carlos.[a] The lateral roots are more or less ramified, and numerous rootlets spread from their lower side into the surrounding soil.

### TRUNK.

There is great diversity in the appearance of the trunk and its ramifications, according to the species, the exposure, and the climate. The largest size is probably attained by *C. daguensis*, of which we have seen specimens of no less than 50 meters estimated height and 1.05 meters in diameter. The largest individual of *C. lactiflua* observed by Mr. Cook measured approximately 25 meters in height, with a diameter of 1.50 meters at the same distance from the ground.[b] In the above-mentioned paper,[c] Koschny speaks of trees 1 to 1.72 meters in diameter, with a trunk length reaching up to 24 meters, as not uncommon in the northern forests of Costa Rica. The more scanty the light the more rapid is also the rise of the trunk and the more prompt the appearance of the permanent branches. In the dark Regenwälder of Central America, namely in Costa Rica and Panama, adult Castilla trees are often met with, the trunks of which shoot up to 15 meters and more, smooth and slender, and supporting only a flat, thinly developed crown. In the open dry districts the branching commonly begins at 3 meters or less above the ground and the trees assume a stouter habit. The branches generally form an acute angle with the main axis, but this is not always true, and in *C. daguensis*, according to notes taken on the spot, they are rather horizontal and spreading.

### TWO FORMS OF BRANCHES.

In the paper already cited Mr. Cook deals at full length with the pseudobranches and self-pruning of Castilla, so that we do not need to dwell on this subject except to note that those deciduous twigs arise from the axils of the leaves, and can be seen also on permanent branches. Their diameter, at the insertion, is never above 3 cm., and they attain from 3 to 4 meters in length, bearing in distichous rows the very large, showy leaves.

### LEAVES.

The leaves of all species of Castilla are deciduous and alternate, with a $\frac{2}{1}$ distichous arrangement that is quite characteristic. They

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[a] Koschny, T. Die Kultur des Castilloa-Kautschuk. Beiheft zu Tropenpflanzer, vol. 5, p. 125. (1901.)

[b] Cook, Culture of Central American rubber tree, loc. cit., p. 23.

[c] Koschny, op. cit., p. 123.

are mostly uniform in size, shape, and other details, and yet in other respects so variable in the same species, according to age, exposure, etc., that they furnish few constant specific characters. In young trees they are generally larger, the petioles are often quite long, attaining no less than 5 cm. in some of our specimens, and the lamina is more rounded. In mature trees the petioles seem to be very short (0.5 cm.) in *C. ulei*, short (0.8 to 1.5 cm.) in *C. australis*, *C. daguensis*, *C. lactiflua*, *C. panamensis*, and *C. nicoyensis*, relatively long (1.5 to 2 cm.) in *C. fallax*, *C. costaricana*, and *C. elastica*, and longest (up to 2.5 cm.) in *C. guatemalensis*. Curiously enough the austral species seem to have a tendency to be short-petiolate, the boreal ones long-petiolate.

The adult leaves vary from ovate and sublyrate to elliptic-lanceolate; they furnish a good taxonomic character in the form of the blade at the insertion of the petiole, this being in some species deeply cordate, in others subacute or scarcely emarginate. This differential peculiarity again seems to have some connection with the geographical distribution of the several forms, deeply cordate ones occupying the northern part of the generic area, while the others are Andean, with the exception of *C. fallax*. As to size, *C. ulei* has the smallest leaves and *C. costaricana* and *C. elastica* the largest ones, but, excepting perhaps the first-named, there is a great variation in all the species, and the dimensions given in our descriptions do not apply to the very large leaves of the young trees.

At the apex the leaf is always more or less abruptly contracted into an acute point. The margin is setose-denticulate in all the species, but the teeth or sinuosities hardly affect the blade itself, except perhaps in *C. costaricana* and *C. panamensis*. Both faces are usually densely hairy, the color of the indument varying from ashy gray or silvery gray to yellowish or brownish. The texture of the whole leaf is mostly coarse and the pinnate venation is very prominent on the lower face.

From the above details it can be seen that on the whole the leaves present very few sharply defined characters and that they could hardly be used alone for the identification of the several species. Leaves of a species from the Atrato Valley in Colombia, which were received not long ago, show, however, such decided peculiarities that we must conclude to the presence of a distinct, undescribed species in that region.

## THREE FORMS OF INFLORESCENCE.

One of the generic peculiarities of Castilla is that all species are, as Mr. Cook expresses it,[a] partly dioecious, that is to say, there are trees that bear, at least for a single season, only male flowers, while in

[a] Science, ser. 2, vol. 18, p. 437. (1903.)

others each female receptacle is flanked by two staminate receptacles, smaller than and somewhat distinct in shape from the flowers of the male specimens. In other words, there are strictly unisexual individuals bearing only male flowers, and other individuals that are truly monœcious, bearing together pistillate and staminate flowers. It has been noticed that the younger trees, blooming for the first time, bear invariably male flowers, but it is by no means certain that there are trees permanently male and others permanently monœcious, nor do we know the governing cause of the explained sexual conditions. The stamens are fertile in both kinds of male flowers and, while the wind seems to be the main agent of pollen transportation, a direct pollination by means of insects between the male and female flowers of the same clusters, or the transportation of pollen from tree to tree by the same agency, is not out of question. The male flowers are usually crowded with small thrips that are also found, but not so frequently, on the female flowers.

Mr. Cook has called "primary" the larger staminate inflorescences found on the exclusively male trees, and "secondary" or "complemental" the ones on the monœcious trees. These expressions are used in the same sense in the course of this paper.

### PRIMARY MALE INFLORESCENCE.

The inflorescences of this class appear in pairs in the axils of the leaves, or in defoliate axils, and have the general appearance of a flattened or depressed cone, or of a fan, more or less emarginate at the base. This fan opens longitudinally, sometimes only by a narrow slit at the top (*C. fallax*), sometimes with the lobes spreading out into a flat disk (*C. nicoyensis*). In other cases the inflorescence is more or less distinctly 3-winged (*C. costaricana*), or the lobes are diversely lobulate or distorted (*C. elastica*). As to the number of receptacles in each axil, it seems to vary from 2 to 8, but to be almost constant in one species or in one group of species. There are no data as to *C. ulei* and *C. australis*. In *C. daguensis*, I noted 1 to 3 receptacles in each axil in the only specimen at hand, but this may be either an error of observation or an anomaly, as geminate receptacles seem to be the rule; the same may apply to *C. fallax*, of which only dry, brittle specimens have been handled. From 2 to 8 receptacles in each cluster were ascertained to exist in *C. lactiflua* and *C. guatemalensis*, while the number seems to be limited to 2 or 4 in *C. costaricana*, *C. panamensis*, *C. nicoyensis*, and *C. elastica*.

The receptacles are sessile or subsessile in *C. fallax*, but distinctly stipitate, as far as known, in the other 9 species. Except perhaps in *C. guatemalensis*, the stipe is not a pedicel in the strict sense of the word, but simply the basal attenuation of the body of the receptacle,

as in the common fig. It is usually provided at the base with a more or less complete involucre of free or subconnate bracts, while the remainder of the outer surface of the receptacle is covered with more imbricating bracts, which, for convenience sake, we have called "scales." On the whole, bracts and scales hardly seem to furnish us with any good diagnostical characters.

Of the six rubber-producing species of the Isthmus, half (*C. lactiflua*, *C. guatemalensis*, and *C. panamensis*) have emarginate or kidney-shaped male receptacles, while the remainder do not present that peculiarity, on account either of their irregular shape (*C. costaricana*, *C. elastica*) or of their mode of dehiscence (*C. nicoyensis*).

The stamens are inserted on the inside surface of both lobes of the receptacles. Most authors seem to have adopted the view that they are distributed without any regular arrangement, and that the bractlets, scales, or floral leaflets that accompany them are all small and isolated. In fact, the disposition of the stamens is dependent on the continuous blades or lamellæ that radiate from the bottom of the receptacle and branch out so as to cover the increasing staminal area. These blades vary in breadth and in the indentation of the margin according to the species, being, for instance, small and irregularly developed in *C. guatemalensis*, and rather broad and conspicuously lobulate in *C. elastica*. The stamens are inserted singly along these blades, or in clusters in the axils or at the ends of their ramifications. The bractlets are very unequally developed in the same receptacle, many stamens being destitute of them, others showing several, while at times bractlets appear where there are no stamens at all. The bractlets also seem to vary in size according to the species; they are few and small in *C. fallax*, *C. nicoyensis*, and *C. panamensis*, numerous and almost exuberant in *C. elastica*. They are generally inserted at the base of the stamen, but in the last species the filament is often provided with an additional foliaceous, accumbent appendage, attached somewhere below the anther. In the same specimens remarkable transitions of a regressive nature occur between stamens and bractlets. Sometimes the bractlet is reduced to an awkwardly long, cylindrical filament, ending with the rudiments of an anther; in other cases the still defective anthers appear on a foliaceous, bract-like filament; and besides these there are perfect anthers borne on a flattened, broad filament, etc. All these anomalies have been noticed in *C. elastica*, the other species investigated being mostly normal.

The stamen itself consists of a rounded, always smooth filament, ending in a claviform connective, on both sides of which are inserted the narrow, elongated anther cells. The connective is in all cases basifix and it is evidently a misinterpreted observation that makes Trécul say that the anther is dorsifix or peltate. The variations in

the length of the filament, in the angle between the latter and the connective, etc., correspond to stages in the development: the normal mature stamen is erect, the dehiscence longitudinal, and the pollen very minute and without peculiarities worth mentioning.

On the whole, as far as is known, these stamens are very uniform in their size and appearance all through the genus. They seem to be of smaller dimensions and sparsely hairy on the connective in *C. fallax;* the cells, usually narrow, are noted as broader in *C. guatemalensis*, where also the connectives were found to have a papillose appearance on one of their faces; a cross section of the filament of *C. elastica* is elliptic with acute edges and the connectives are here larger than in the other species, with narrower cells; and finally, as has already been mentioned, there occurs on these filaments, in at least one species, a small, accumbent bractlet.

### COMPLEMENTAL MALE INFLORESCENCE.

The small male receptacles accompanying in pairs the pistillate ones, to which this name has been given, have been accurately represented in a considerable number of drawings of the heretofore all-embracing *C. elastica*, beginning with the plate added to Cervantes's original description and ending with the figures in Warburg's work on rubber plants.[a] Trécul[b] gives also a good representation of a complemental inflorescence and may not have known the primary one. But, strange to say, no botanist seems to have noticed the variance of this inflorescence from the primary one up to the time of Mr. Cook's investigations on this subject. In his bulletin on Castilla[c] Mr. Cook says in part: "A pair of much smaller and more fig-like clusters of male flowers is often attached immediately under a cluster of female flowers." As a matter of fact, these auxiliary male inflorescences are always present by the side of the female flowers in every Central American species and very likely also in the South American ones, although information on this point is still lacking. Notwithstanding their reduced dimensions, they are perfect in every way, differing only slightly in shape from the primary inflorescences. They seem to be always geminate, and always clavate or pear-shaped, except in *C. lactiflua*, where they are flabellate. In this species they also seem to open broader than in any of the remaining ones, but the dehiscence is always more or less slit-like, except in *C. costaricana*, where the opening is rounded, and in *C. nicoyensis*, where these receptacles hardly open at all. There seem to be specific differences in the length of the stipe, this being very short in *C. lactiflua* and *C. costaricana*, longer and more slender

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[a] Warburg, O. Les plantes á caoutchouc, p. 98. (Paris, 1902.)

[b] Ann. Sci. Nat. ser. 3, vol. 8, pl. 5. (1847.)

[c] Culture of Central American rubber tree, loc. cit., p. 21.

in the other species investigated in this respect. The scales covering the outer surface of the receptacle, as well as the basal bracts, are more or less free, broad, or acute, etc., but on the whole they do not seem to furnish us with any definite character. Neither do the stamens differ in shape, dimensions, or arrangement from those in the primary inflorescences.

## PISTILLATE INFLORESCENCE.

In all species of Castilla the female inflorescence consists of a cup-like receptacle, more or less open, according to the number of included flowers and also to the stage reached in their development. The figures and descriptions vary according to the period of the investigation. Hooker gives very good figures,[a] and so do Warburg[b] and Cook,[c] but other authors, as even Hemsley in his plate of *C. australis*, give as inflorescences what are really fruit receptacles in a more or less advanced condition.

The imbricate scales are in several rows, more or less free, narrow and acuminate at first, but usually broadened, obtuse, and grown together in later stages. Every degree of transition is observed between the marginal scales or bracts and the perfect flowers, so that the first scales must be considered morphologically as aborted flowers.

The development of the flowers takes place successively from the center to the periphery, the full anthesis being reached with the appearance of the stigmas. The number of flowers on each receptacle is variable within certain limits for the same species, and there usually remain on the outside numerous undeveloped flower buds that are not easily distinguished from the bracts or scales.

The perianth is tubulose and with thick walls. It is always free and attenuate at the tip, entire or obscurely lobulate in *C. fallax*, *C. lactiflua*, *C. costaricana*, and *C. panamensis*, and 3 to 5-lobate in C. *australis*, *C. guatemalensis*, *C. nicoyensis*, and *C. elastica;* hairy without and within in *C. lactiflua* and *C. nicoyensis*, but on the outside only in the other species. In *C. australis* and *C. fallax* these flowers are free to the base; they are slightly connate or free in *C. guatemalensis* and *C. panamensis*, connate for about half their length in *C. nicoyensis* and *C. elastica*, and almost completely concrescent in *C. costaricana.*

Each flower contains one pistil. The ovary is 1-celled and partially adherent to the perianth. There is also only one ovule, more or less lobulate at the lower part and inserted on the placenta near the top of the ovary cell in such a way that the funicle is very close to the micropyle.

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[a] Trans. Linn. Soc., ser. 2, vol. 2, pl. 27. (1885.)

[b] Les plantes à caoutchouc, p. 98.

[c] Culture of Central American rubber tree, loc. cit., pl. 6.

The style varies in length, thickness, etc., according to the species thus affording good means of identification. It is long (3 mm. and over), slender, and smooth in *C. daguensis* and *C. panamensis;* long and sparsely hairy in *C. fallax;* slender, smooth, and about 2 mm. long in *C. costaricana.* In *C. lactiflua* it is thick and short (1.5 to 2 mm.) with spinescent bristles at the base only, while in *C. guatemalensis* the hairs, longer and not so stiff, extend around the base and on one side up to the stigmas. *Castilla nicoyensis* has a very short (1 mm.), thick, and quite smooth style, but in *C. elastica* this organ varies in length from 0.8 to 1.5 mm., and is also thick and sparsely covered with short hairs. The style of *C. australis* is the most reduced and is also hairy.

The stigmas are normally two to each style, but very often three or five are found in *C. elastica*, and not seldom three in *C. guatemalensis.* They are short and cushion-shaped in *C. australis*, rather slender and moderately developed in *C. daguensis*, *C. fallax*, *C. costaricana*, and *C. panamensis*, and long, broad, and conspicuously twisted in the other Central-American species. In the Yucatan specimens of *C. guatemalensis* they are so prominently long and otherwise peculiarly shaped that we are in doubt as to whether these specimens do not constitute a separate type. In most of the species the stigmatic surface is more or less papillose-verruculose, but in *C. daguensis* the papillæ, instead of being covered with a sugary nectar, are provided with an indument of long, flagellate hairs. In *C. australis* this same surface is also hairy, if we may judge from Hemsley's plate.

### INFRUCTESCENCE.

Directly after the pollinating process is over, the perianth usually begins to thicken and it then turns gradually into an orange red pulp. As with the growth of the ovules, now changed to seeds, more space is needed, the receptacle increases its surface, all its parts, but mainly the outer scales, altering their original size, shape, and texture. As these changes are gradual and it is often difficult to decide whether a given receptacle is still an inflorescence or has become an infructescence, the characters derived therefrom are always more or less indefinite and should be used with caution in the identification of the several species.

An exception to the thickening and coalescence of the perianths is found in *C. fallax*, in which they remain free, green, and hairy, with more or less adherence to the seeds. In the other species the ripe pulp is sweetish and eagerly sought for by certain birds; in *C. ulei* it is even a favorite delicacy of the native Indians. In this species the whole infructescence has a quite characteristic appearance, being globose and entirely covered with scales and containing only 3 to 5

achenes. In *C. daguensis* and *C. panamensis* the cup-like receptacle remains rather deep and closed, while it is quite shallow and open in *C. fallax*, *C. lactiflua*, *C. costaricana*, *C. guatemalensis*, and *C. nicoyensis*. The counterpart of the closed receptacles of *C. ulei* is found in *C. elastica*, where these organs are more or less distorted and reflexed so as to embrace the twig on which they grow. As to size, they are exceptionally large in this last species, as also in *C. costaricana*.

No data are available as to the seeds of *C. australis*, *C. daguensis*, and *C. lactiflua*. *Castilla fallax* has the smallest seeds, *C. panamensis* and *C. ulei* the largest ones; they are roundish and also small in *C. nicoyensis*, ovoid-elongate and rather large in *C. ulei*, distinctly ovoid in the remaining species. In all cases they are more or less flattened by being pressed one against another. The integuments consist of a white, translucent testa, covering a brownish or purplish arillus. There is no albumen and the cotyledons are large.

## PRELIMINARY SURVEY OF SPECIES.

The writer does not make any claims to finalty in the status here assigned to the forms described. As the fruit of his own experience in the field, supplemented by the observations kindly supplied by his fellow-workers, Messrs. O. F. Cook and G. N. Collins, and of his careful study of a large amount of well preserved materials, he has been able to satisfy himself that most if not all of these forms offer constant characters to be found in all specimens proceeding from a certain area and to be easily recognized by any skilled botanist. At the same time it must be borne in mind that, owing to the uniformity in the general aspect of the representatives of the genus, it really needs an exercised eye to distinguish them on sight. Microscopic examination of complete specimens, including branchlets with leaves and terminal buds, clusters of both male and female inflorescences, and ripe fruits, is necessary to insure correct identification.

The ten forms here described have not, probably, the same taxonomic value; the distinctive characters may prove more pronounced and weighty in some, and not so sharply defined or of less significance in others. To the former a definite specific status will be readily conceded, while the latter may remain in abeyance or be reduced to the rank of subspecies or even of mere forms. Neither have we necessarily recorded the whole number of specific representatives of the genus; we know almost nothing of several of the rubber-producing trees of South America, especially of those of Ecuador, Venezuela, and Colombia, and it is even probable that *Castilla elastica* may not be the only form peculiar to Central Mexico. The present attempt at a monograph of the genus does not, therefore, pretend to be either complete or final. Among the species the status of which can not be

disputed we have *Castilla ulei*, *C. fallax*, and *C. australis;* that is to say, the known forms of the strictly South American group, with the leaves more or less rounded at the base.

*Castilla ulei* is not yet well known, but its fruits present such well defined peculiarities as to segregate it widely from all other studied species. Each receptacle contains only 3 to 5 elongate nutlets surrounded by a soft pulp: the leaves also appear to be smaller than in any other species.

*Castilla fallax* is another very aberrant type on account of its dry fruits completely detached from each other, as are the female flowers. The leaves are almost glabrous and shiny above, and covered beneath with very short, soft hairs.

*Castilla australis* offers a unique character in the shape of its style and stigmas. These latter are short and broad and completely exserted. The female flowers seem also to be free to the base, with an urceolate perianth. This type is very imperfectly known, but its localization at the southern extremity of the generic area makes it quite probable that it is a well defined species.

We could include among those strongly individualized types my *Castilla duguensis*, but I shall refrain from doing so at present on account of its possible identity with the preceding species. The only obvious difference between the two consists in the shape of the style and stigmas, and the character of these organs as described by Hemsley is so much out of the usual line that I am compelled to suspect an error of observation or a casual anomaly in the specimens investigated at Kew.

The Central American forms have large leaves, distinctly cordate at the base, and they are so uniform in their general aspect that up to the present they have been considered as all belonging to one species, *Castilla elastica*. Observation, however, has shown that the floral parts, as well as the fruits, present constant and definite differences.

In a first subdivision, including *Castilla laetiflua* and *C. costaricana*, the primary male inflorescences are always borne on very short and thick peduncles (pls. 27, 31). This character, which we know to be really constant in both species, is in itself quite sufficient to segregate them from the forms of the remaining group in which the same stipes are relatively long and slender (pl. 37). On the other hand, there can be no doubt as to the characters that distinguish *C. laetiflua* from *C. costaricana*. The complemental inflorescences are unlike; the style is short, thick, and bristly, with long stigmas in the former, while the same organ is long, smooth, and with tongue-like, reduced stigmas in the latter. In the first, further, the drupes are not completely fused together in the pulp, as they are in the latter, and the number of seeds in each receptacle is less.

The second subdivision of the Central American group is the more perplexing one, first, on account of the scarcity in some cases of good material for their study; second, because of my not having had any opportunity to investigate standing specimens of *C. elastica* and *C. panamensis;* and lastly, owing to the fact that imperfect materials have been collected in the territory covered by *C. elastica*, *C. lactiflua*, and *C. guatemalensis*, which either belong to another as yet undescribed form or else appear as connecting links between the above types, considered here as specifically distinct. It is not unlikely, therefore, that further researches may modify the present arrangement of this group.

Meanwhile, *C. guatemalensis* appears as a good type, standing apart from the three remaining species, *C. panamensis*, *C. nicoyensis*, and the original type of Cervantes, on account of its unusually long-stipitate male inflorescences, united in clusters of from 6 to 8. The similarity of the styles may lead one to confound this species with *C. elastica*, but if the small stipules of the latter and its enormous fruiting receptacles, distorted so as to embrace the twig on which they are borne and containing seldom less than 35 seeds, are compared with the same organs in *C. guatemalensis*, the possibility of a specific community between them becomes very small. The same disparity separates *a priori C. elastica* from the two southernmost Central American species, *C. nicoyensis* and *C. panamensis*, and these in turn differ from each other by their styles, their fruits, and several peculiarities of the male inflorescences.

## SYSTEMATIC TREATMENT.

### REVISION OF GENERIC CHARACTERS.

**Castilla** Cervantes, Gaceta de Literatura de Mexico, Suppl. July 2, 1794.

*Castella* "J. L. M." loc. cit.

*Castillou* auct.[a]

Flowers monœcious, thickly set in diversely shaped, unisexual inflorescences, covered outside with imbricate bracts. Male receptacles of two kinds, the primary ones in one to several pairs or sometimes absent, more or less flabellate or compressed and by themselves in the axils of leaves or on defoliate nodes, the complemental ones smaller, clavate or flabellate always accompanying the female inflorescence. Perianth none. Stamens numerous, irregularly scattered along numerous multiform bractlets; filaments and anthers erect, the latter ovate, 2-celled, the cells attached laterally on a broad connective and opening longitudinally. Gynœcium entirely wanting. Female receptacles more or less flattened or cupuliform. Perianth urceolate, briefly 3 to 5-lobate, the lobules thick, closely contiguous. Ovary inclosed, adnate to the perianth; style short, the stigmatic branches normally 2, sometimes 2 to 5, exserted, filiform or lanceolate, papillose, spreading; ovule anatropous, pendent from the apex of the ovular

[a] Name first used in Tracts Relative to Botany, London, 1895.

cavity. Staminodes none. Fructiferous perianths enlarged, dry or fleshy, more or less adhering to the receptacle and to each other and inclosing the rounded nutlets (achenes); pericarp crustaceous. Seed pendulous; episperm membranous, brownish; albumen none; cotyledons thick and fleshy, similar in size and shape, the radicle small and superior.

Laticiferous trees. Leaves alternate, short-petiolate, often large, entire or minutely denticulate, penninerve, deciduous; stipules ample, intrapetiolar, caducous, connate into the form of a shell.

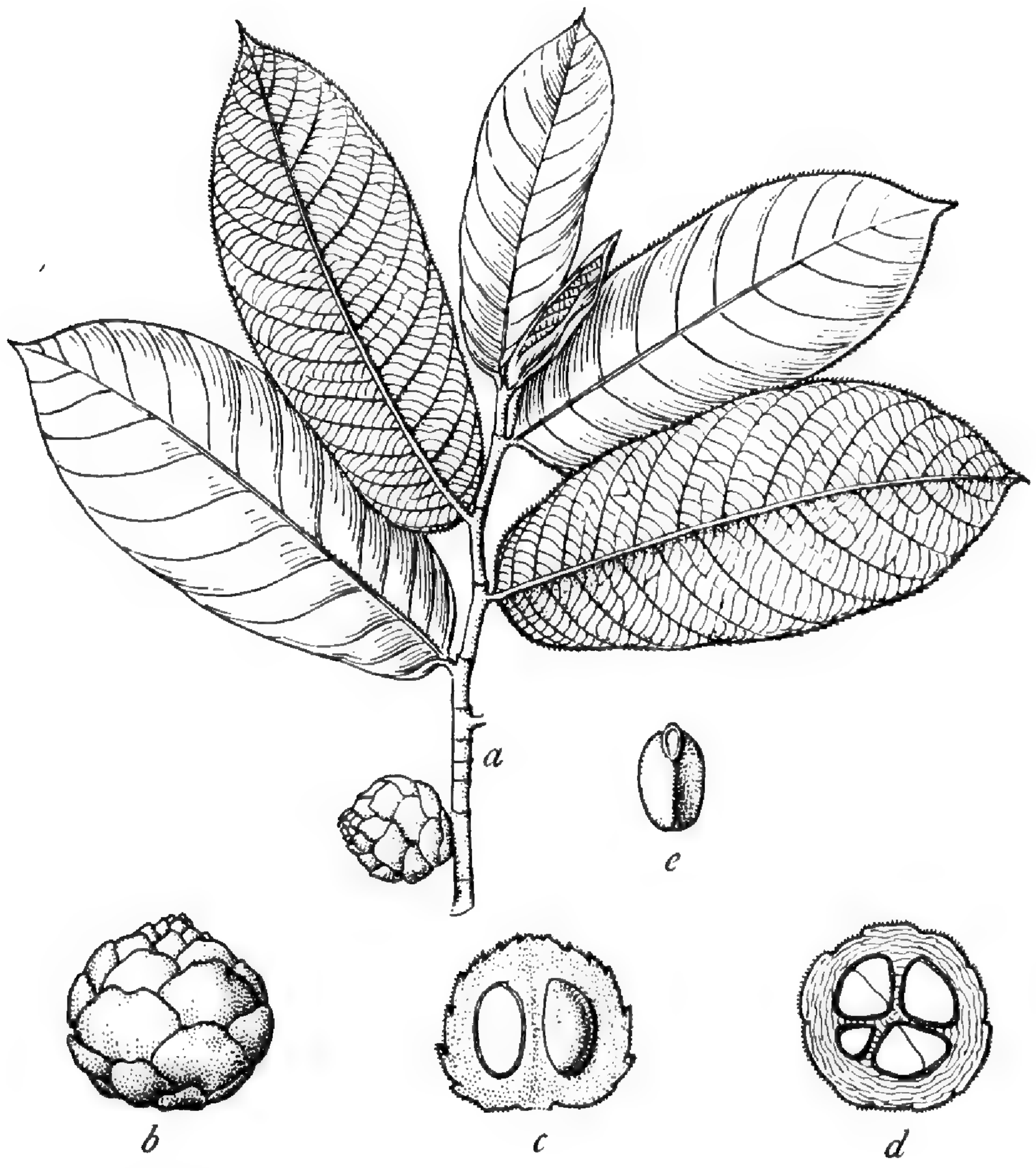
Species about 10, following the foot of the mountains of the western side of America from Mexico to Peru and Bolivia.

## DESCRIPTION OF SPECIES.

### KEY TO THE SPECIES.

Leaves submarginate, rounded, or subacute at base.
- Receptacles ovoid; fruits 3 to 5 in each receptacle---- 1. *C. ulei.*
- Receptacles flattened; fruits more than 5 in each receptacle.
  - Fruits free to the base, greenish and dry at maturity---------- 2. *C. fallax.*
  - Fruits more or less coalescent, the pericarp at maturity an orange red, succulent pulp.
    - Style very short; stigmas cushion-shaped----- 3. *C. australis.*
    - Style long and slender; stigmas elongate, more or less twisted---------- 4. *C. daguensis.*

Leaves cordate or deeply emarginate at base.
- Primary staminate inflorescence short-stipitate (stipe not over 1 cm. long).
  - Complemental male inflorescence flabellate, opening in a long slit. Style short, thick, and hairy-spinescent; stigmas long and twisted- 5. *C. lactiflua.*
  - Complemental male inflorescence clavate, with a small, rounded opening. Style long, slender, and smooth; stigmas short, flat, and pubescent---------- 6. *C. costaricana.*
- Primary staminate inflorescence long-stipitate (stipe over 1 cm. long).
  - Male receptacles in clusters of 6 to 8; each opening broadly by a slit; stipes long and slender; style stiff-hairy at base---------- 7. *C. guatemalensis.*
  - Male receptacles in clusters of 4.
    - Style long, slender, and smooth; stigmas rather small. Male receptacles regularly flabellate---------- 8. *C. panamensis.*
    - Style short and thick, with large stigmas. Lobes of male receptacles reflexed or distorted at the time of flowering.
      - Lobes of the male receptacles opening to a flat disk; interstaminate bractlets very few. Style glabrous----- 9. *C. nicoyensis.*
      - Lobes of the male receptacle distorted-reflexed; interstaminate bractlets numerous. Style sparsely hairy; fruiting receptacles very large----10. *C. elastica.*




CASTILLA ULEI WARBURG.

**1. Castilla ulei** Warburg, Bot. Jahrb. Engler **35**: 654. 1905. PLATE 22.

A tree 20 to 40 meters high, with long, spreading, superficial roots. Twigs terete, 3 to 4 mm. in diameter, at first densely hairy, ferruginose-tomentose, later sparsely covered with appressed, stiff hairs; bark brownish.

Petioles short (9.5 cm.), slender and hairy. Leaf blades oblong, 12 to 24 cm. long, 4 to 6 cm. broad, rounded or subtruncate and slightly oblique at base, briefly acuminate or apiculate at tip, densely villose-ferruginose when young, then hispid-glabrescent above, pale and tomentose beneath; margin subentire, minutely setose-denticulate. Stipules caducous, large, spathiform, lanceolate, villose-ferruginose, their annular scars 4 cm. long and 1 cm. broad.

Inflorescences not known.

Fruit receptacles solitary in foliate or defoliate axils, almost sessile, globose and slightly flattened at base, 2 cm. long and 2.5 cm. in diameter when dry, but larger in the fresh condition, covered outside to the apex with imbricate bracts (scales), 3 to 5-seeded. Seeds oblong with three flattened sides, 12 mm. long, 6 mm. in diameter, surrounded by a soft pulp; testa very thin; endosperm wanting; cotyledons thick (according to Warburg and Ule, loc. cit.).

BRAZIL: Marary, September 18, 1909, *Ule* 5359; Belem, Jurua Miry, October, 1900, *Ule* 5900.

This species is distinctly characterized by its remarkable fruits, which are said to be edible when in fresh condition. The leaves are smaller than in any other species of the genus and the seeds proportionately longer.

EXPLANATION OF PLATE 22.—A, branchlet with female flower; B, fruit; C and D, cross-sections of fruit; E, seed. A, one-half natural size; B-E, natural size.

**2. Castilla fallax** Cook, Science n. ser. **18**: 438. 1903.

PLATE 23. FIGURES 45, 46.

*Castilloa tunu* Hemsl. Hook. Icon. Pl. IV. **7**: *pl. 2651. f. 1–7* (*f. 8–15* excl.) 1900, in part.

A medium-sized tree. Floriferous branchlets thick, filled with a whitish pith, covered outside with a dense growth of stiff, appressed hairs. Internodes 3.5 to 4 cm. long.

Leaves rather large and coarse. Petioles thick, 1.5 to 2 cm. long, hairy, sulcate. Leaf blades 30 to 40 cm. long, 10 to 15 cm. broad, oblong or lanceolate-oblong, rounded or subacute at base, acuminate, deep green, rough and provided with scanty appressed hairs above, paler and covered with a short, appressed pubescence beneath; midrib and primary veins very prominent; margin of young leaves minutely dentate, but becoming entire with maturity. Stipules caducous, rather short (4 to 5 cm.), marked with wide-spaced, longitudinal ribs, smooth and hairy outside, glabrous and purplish within.



FIG. 45.—Male inflorescence of *Castilla fallax*. Scale 3.

Receptacles of the primary staminate inflorescence sessile or subsessile, single or in pairs in the axils of leaves, small (1.5 to 2 cm. across), flabellate and opening by a long, arcuate slit. Outer scales small (1.5 mm. long, 1.5 to 2 mm. broad), scarcely concrescent, hairy outside. Interstaminate bracts few, small, triangular, subciliate. Stamens 1 to 1.5 mm. long; filament short; connective very thick, with a few stiff hairs on the median line; anther cells small, glabrous.

Secondary staminate inflorescence wanting on specimens examined.

Receptacles of the pistillate inflorescence solitary, sessile, rather small. Scales free, broadly ovate-triangular, acuminate, silky outside, smooth inside. Flowers free to the base. Perianth thick, about 4 mm. long, densely silky out-

side and on the upper part of the inside, divided at the tip into 4 or 5 rounded lobules. Ovary ovate, only partly adhering to the perianth; ovule and style inserted laterally. Style 3 to 3.5 mm. long, slender, sparsely hairy; stigmas rather short, twisted.

Receptacles of the infructescence very shallow. Achenia not fleshy nor confluent, pubescent, carinate on the suture of the lobes of the perianth. Seeds small (about 8 mm. long, 6 mm. in diameter), ovate, slightly compressed.

COSTA RICA: Quebrada de Potrero Grande, near Térraba, Diquís Valley, at an altitude of 150 meters, *Pittier*, flowers and fruit, March 18, 1898 (Instituto fís.-geog. Costa Rica no. 12051).

EXPLANATION OF PLATE 23.—*a*, *b*, portions of a branch bearing male inflorescences; *c*, piece of bark from the same to show the strigose hairs; *d*, calyptrate bract (or bracts) which shields the male inflorescence; *e*, section of a young male inflorescence; *f*, an involucral scale; *g*, bracteoles between the male flowers; *h*, a male flower; *i*, infructescence seen from below; *j*, the same from above; *k*, a section through a portion of the same, showing that the carpels (pistils) are completely immersed; *l*, a single pistil (fruit); *m*, seeds of different shapes; *n*, embryo; *o*, portion of one cotyledon and axis. Reduced one-half from Hooker's Icones, loc. cit., pl. 2637. In the original all the figures more or less enlarged except *a*, *b*, *i*, *o*. The explanations are as in Hemsley; for exclusions see observations immediately below.

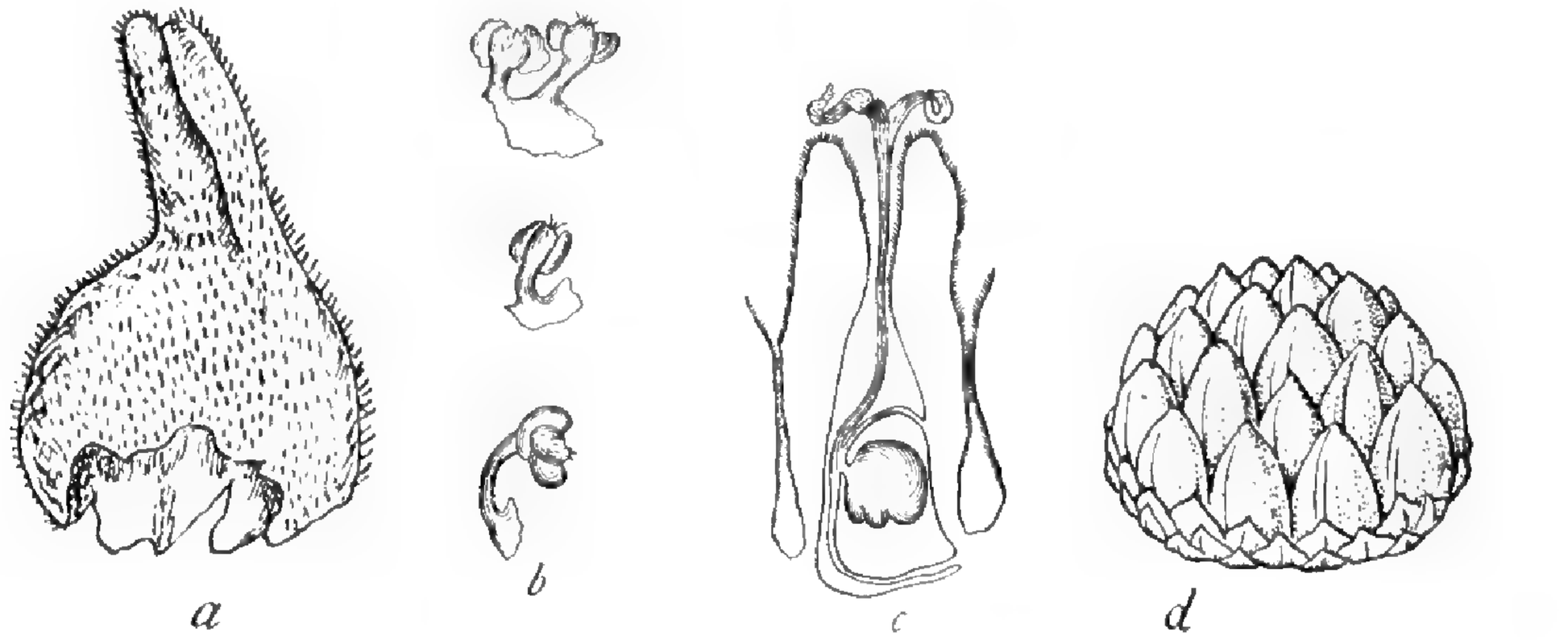
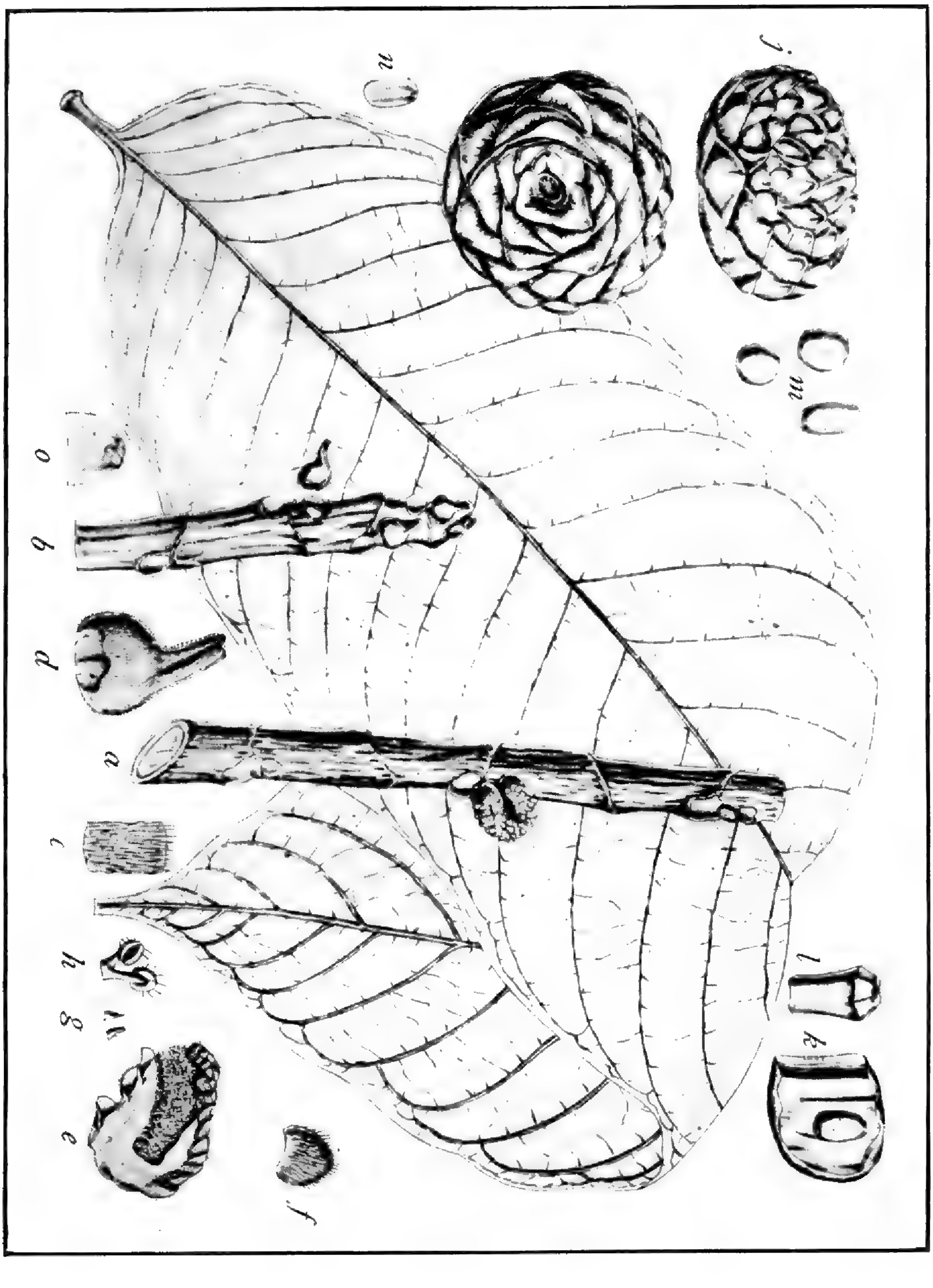



FIG. 46.—Floral details of *Castilla fallax*. *a*, Calyptrate bract protecting the male inflorescence; *b*, forms of stamens; *c*, female flower; *d*, infructescence. *a*, After Hemsley; *d*, after Warburg. *a*, *d*, Natural size; *b*, *c*, scale 3.

According to observations made by me and published in 1903,[a] the leaves of seedlings have remote marginal teeth that soon disappear, except at the base of the blade. On dried specimens from mature trees no such detail is noticeable, which shows that the teeth are really tufts of hairs. Another interesting feature, brought to light by Mr. Hemsley, is the calyptra-like bract that covers the male floral buds. (Fig. 46, *a*.) In plate 2651 of Hooker's Icones, already referred to, we have excellent representations of parts of *C. fallax* in the drawing of the leaf and in figures 1 to 7. Figure 8 shows the anthers as hairy, which is not the case with this species, and the stamens are not regularly geminate. The drawings of fruits (figures 9 to 11) do not belong to *C. fallax*, but more likely to *C. guatemalensis*. Figure 12 can hardly refer to a Castilla, unless it represents, instead of a pistil, a closed female flower. Of figures 13 to 15 it may be said that they apply to any of the small-seeded forms of the genus.

As to the further distribution of *C. fallax*, we are reduced to oral information, not always from very reliable sources. Personally, the writer has met the tree all over the Diquís Basin, at altitudes not exceeding 600 meters, and also near the mouth of the Savegre River, and along the Coto River in the

[a] Boletin del Instituto físico-geográfico, vol. 3, p. 129 (1903).




CASTILLA TUNU HEMSL.

Golfo de Osa district; it was found only once, however, in condition to be collected. According to Térraba Indians, used to traveling between their village and David in the Republic of Panama, there are several individuals or groves of the same species along the mule-path between Rio Chiriquí Viejo and the mentioned town of David. These localities, as well as those where specimens of the tree have been collected, are on the Pacific side of Central America. A Frenchman who had spent several years in and about Bluefields, in Nicaragua, and whom the writer met in Port Limon in 1902, informed him that the "hule macho," called also "hule colorado" or "gutta-percha" by the native Spaniards and "tunu" by the Mísquito Indians, is rather common on the Atlantic coast of Nicaragua. This seems to be confirmed by Koschny. There are also indications, collected in Guatemala, of the presence of such a tree in eastern Spanish Honduras; but, in the absence of herbarium specimens, it is not possible to decide whether the last-mentioned data refer to *C. fallax*, or to the enigmatic *C. tunu* of British Honduras. The only definite character heard of is the absence from the latex of merchantable rubber.

This species and the tunu of British Honduras are distinguished from the other Central American species of the genus by the very important fact that *they do not produce commercial rubber*. The milk coagulates in a hard, sticky, unelastic mass, erroneously called "gutta-percha" by the natives, the price of which is so low as to render its collection unprofitable. It is therefore of urgent necessity to publish accurate and detailed descriptions of these useless species, so as to avoid the mistake of planting or distributing their seeds for agricultural purposes. Unfortunately, however, the attempts hitherto made at formulating their distinctive characters have only resulted in confusion.

As far back as 1883, Sir Daniel Morris mentioned "tunu" in his book on British Honduras, but looked upon it as the local name of the true rubber tree. Nevertheless, his description of the fruit is more suggestive of *C. fallax* than of the Mexican *C. elastica:* "The fruit, of a brownish green color when ripe, has very much the appearance of a raspberry flattened or depressed, about an inch in diameter, the numerous seeds being massed together and enclosed in papery capsules, covered with a brown tomentum."[a] This account does not contain any allusion to the red pulp that characterizes the fruit of the true *C. elastica* and seems to point to the presence in British Honduras of a species the nutlets of which are free and dry. At the same time, it is known from other sources that the name "tunu" applies to a species that does not produce rubber, and is therefore distinct from *C. elastica*.

Sir Joseph D. Hooker does not mention Morris's work in the memoir he presented in 1885 to the Linnean Society on "Castilloa elastica and some allied plants." In Hooker's paper is found a short description of fruits assumed to belong to the tunu of British Honduras, illustrated by 3 drawings;[b] but neither the description nor the figures of these fruits indicate any relation to *C. fallax*. Some of the fruits ascribed on the same plate to *C. elastica* (figs. 1–6) appear even more similar to those of the former species than those that represent the tunu, and these bear a striking resemblance to *C. costaricana*.

Writing in 1898,[c] Mr. Hemsley rectifies the error of Morris in applying the name "tunu" to *C. elastica*, accepting Hooker's statement of the existence in British Honduras of a second species of Castilla. As a further proof, he mentions that Mr. Rowland W. Cater has sent leaves of what is known in that coun-

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[a] Morris, D. The Colony of British Honduras, p. 74. (1883.)
[b] Trans. Linn. Soc. Bot. ser. 2, vol. 2, p. 212, pl. 28, figs. 7–9. (1885.)
[c] Kew Bull. Misc. Inform., 1898, p. 141.

try as "tunu," "chaperno," "male rubber-tree," or "sterile rubber-tree."[a] Previously, the same collector had sent fruits, which, as we shall see, have been described as those of *C. tunu*.

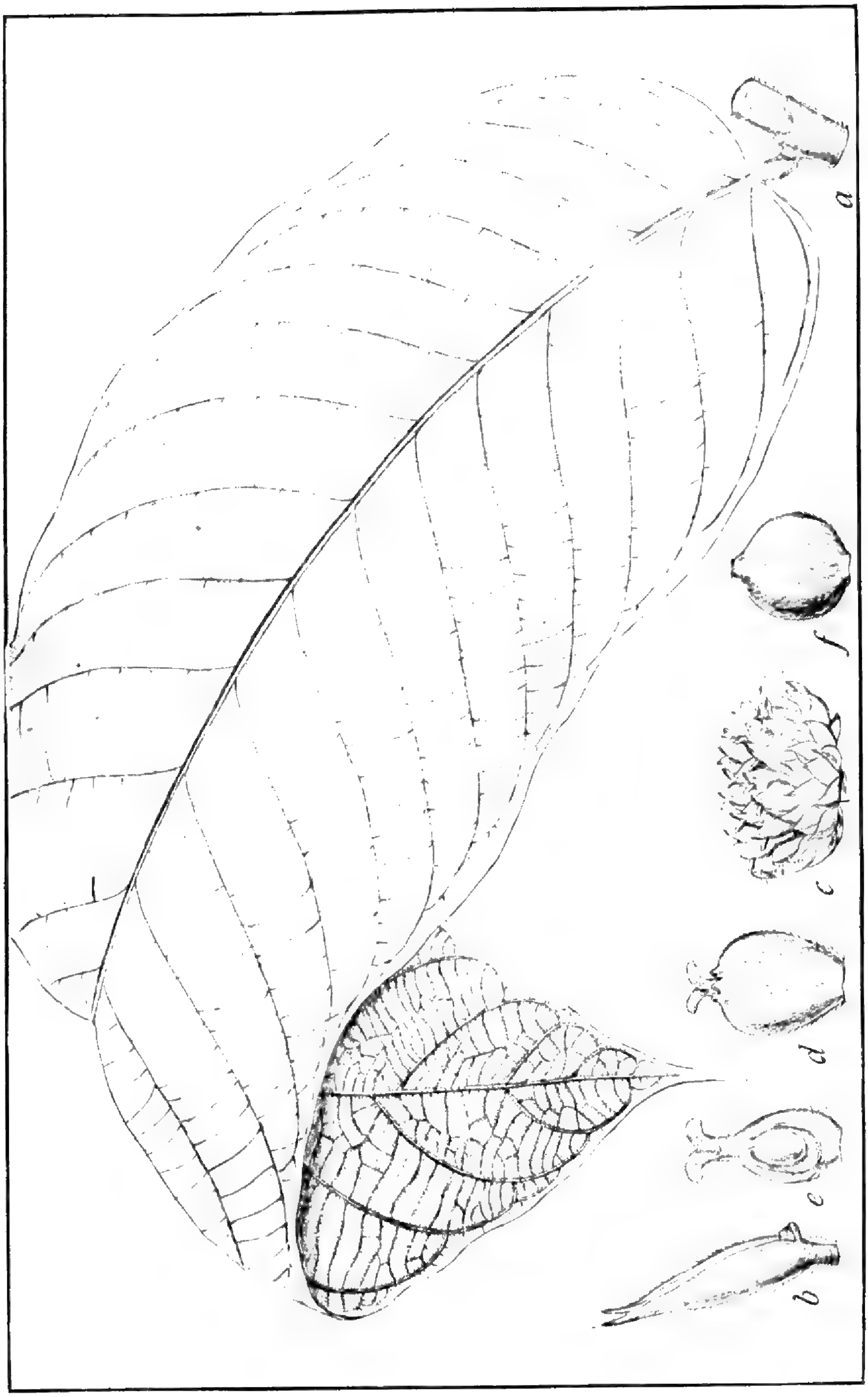
A further step was taken in 1900 by the same botanist, naming and describing the tunu as a distinct botanical species. The diagnosis agrees with Hooker's account in stating that the fruits are almost entirely immersed, while the detailed description is drawn from incomplete specimens, assembled from localities so far apart as Belize and the Diquís Valley of southern Costa Rica. Mr. Hemsley was certainly justified in trying to settle the status of the Honduras tree, but the validity of a species established on these heterogeneous materials is none the less doubtful.

The characters of the twigs, leaves, and primary male inflorescences were obtained from specimens collected by the writer in Costa Rica March 18, 1898, along a small river east from Térraba, and from a tree readily distinguished, even by the Indians, from any of the other species then included under the name of *Castilla elastica*. Several sets of these samples were presented to Mr. Poisson, son of a well-known botanist of the Paris Museum, who in turn sent part of these to the Kew Herbarium. Although most of the specimens were complete, except for the female flowers, which were not generally in season at the time of the collection, Mr. Hemsley seems to have missed the fruits, and having mentioned the fact to the younger Poisson on the occasion of an interview that took place at Kew, the latter offered to send him a few of them, collected by himself and preserved in a formol solution. Now the present writer guided and helped Poisson in every step of his investigations in Costa Rica, and he is consequently in position to affirm that the French explorer did not see a single grown Castilla tree on the Pacific slope of that country, nor did he collect any specimens of "hule macho," which he improperly calls "hule machado." His specimens of fruits, preserved in formalin, all proceeded from trees of *Castilla costaricana*, growing at Santa Rosa, near Guápiles, on the plains bordering the Atlantic. Statements of the case published by the elder Poisson contain several other errors which may well have contributed to support Mr. Hemsley's contention that the fructiferous receptacles sent from Honduras by Mr. R. W. Cater belonged to a species identical with the Costarican hule macho.[b]

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[a] "Tunu" or "toonu" is the name used for the tree by the Caribs inhabiting along the coast from Cape Gracias á Dios to the Mexican border; "chaperno" is a Spanish name, generally applied to certain hard-wood leguminous trees; the qualificative of "male," as used above, is simply the translation of the Spanish "macho," which, applied to plants, indicates often, although not always, the absence of certain useful properties found in near related species, rather than any sexual peculiarity; in much the same way, it is likely, the word "sterile" is used here to indicate the lack of rubber in the tree.

[b] Bull. Mus. Hist. Nat. Paris, pl. 6, p. 138. (1900.) Also Rev. Cult. Colon, pl. 6, p. 302. (1900.) The paper in the Revue is a reproduction of the first, which was presented to the 43rd meeting of the naturalists of the Museum, March 27. 1900. It states that after having mentioned to Mr. Poisson the younger the existence of an undescribed species of Castilla, Mr. Pittier took him to the spot where the tree grows, where they collected twigs with fruits and put some in the preservative fluid; first wrong statement, since the nearest known station of the new species in question is a two days' march south from San José and on the Pacific coast, while the specimens collected and preserved by Poisson were collected on the Atlantic side of the country and belong to *C. costaricana*, a species described by Liebmann in 1851. The distinctive character of the fruit given in the paper by Poisson is precisely one of the specific attributes of the last




CASTILLA AUSTRALIS HEMSL.

A deeper and more intricate confusion was thus produced, so that the diagnosis of Hemsley's *C. tunu*—"affinis *C. elastica* Cerv., a qua differt foliis basi haud cordatis utrinque multo minus hirsutis, *drupeolis receptaculo fere omnino immersis*"—definitely excludes the Costarican species which furnished most of the data of the detailed description. It also appears very doubtful whether the two characters mentioned in the diagnosis are really combined in the Honduran tunu, the specific peculiarities of which are practically unknown, though its distinctness is hardly to be denied in advance of more adequate knowledge. The previous history of the species and the application of the local Honduras name "tunu" as the botanical designation of the same may also be taken as indications of the Honduran specimens being intended to constitute the type of Hemsley's species. Under such circumstances, and without denying the possible identity of the hule macho and the tunu, it seems necessary to leave Hemsley's name in abeyance until the real characters of the Honduras species can be made clear.

Such was the view taken in 1903 by Mr. O. F. Cook, of the U. S. Department of Agriculture, after devoting considerable attention to the study of the Central American rubber tree.[a] Basing upon the conclusive discrepancies in Hemsley's diagnosis and on his own personal acquaintance, mostly acquired in the field, with the several species of Castilla, he found it preferable to consider the Costarican hule macho as a distinct species, taking as type a more complete set of the same specimens that furnished a part of the description of Hemsley's *C. tunu*, a course that appears to be justified by the evidence reviewed above.

**3. Castilla australis** Hemsl. Hook. Icon. Pl. IV. **7**: *pl. 2676.* 1901. PLATE 24.

Evergreen (?) tree with a smooth, erect trunk and horizontal branches. Young twigs and leaves silky-tomentose. Fructiferous twigs thick.

Petioles about 1 cm. long. Leaf blades coriaceous, oblong or oblong-lanceolate, 30 to 40 cm. long, 10 to 18 cm. broad, slightly emarginate at the base, abruptly acuminate at tip, glabrous or at first glabrescent above, hirsute, principally on the midrib and primary veins beneath; margin undulate; primary veins 17 to 19, arcuate, running into each other along the margin, hardly impressed above, prominent beneath. Stipules lanceolate, acute, 4 to 5 cm. long, early deciduous.

Male inflorescences unknown.

Female receptacles stipitate, solitary in the axils of the leaves; stipes 2 to 2.5 cm. long; bracts (scales) in several rows, acuminate, rather narrow and apparently free. Perianth free to the base (according to drawing), lobulate at crown, hairy outside. Style short, thick, and hairy; stigmas very short, cushion-shaped, minutely hairy on the inner (upper) face (?).

Fructiferous receptacles not known.

(Description according to Hemsley and the notes quoted from Pearce, loc. cit.)

PERU: Morro Zungo (region of Cuzco?), common in woods at 1,300 to 1,700 meters above sea level. Female flowers, January, 1866, *Pearce*.

EXPLANATION OF PLATE 24.—Fig. *a*, leaf; *b*, stipules; *c*, a female inflorescence; *d*, a female flower; *e*, pistil with part of the ovary removed; *f*, an immature nut. Reproduced from Hemsley, loc. cit., on a scale of one-half; in the original *c–f* said to be "enlarged."

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species. Further, Mr. Poisson states that "it is wonderful that a tree that supplies a part of the rubber of Costa Rica, etc., is not yet known by botanists;" this is another double mistake, as *C. costaricana* has been known as such for over fifty years and the *hule macho* does not afford any amount of commercial rubber.

[a] See citation, p. 253.

**4. Castilla daguensis** Pittier, sp. nov. PLATE 25. FIGURE 47.

A tree reaching 50 meters and over; trunks 60 to 100 cm. in diameter. Floriferous twigs covered with not very dense bristly, appressed hairs. Internodes 2 to 5 cm. long.

Leaves rather large, petiolate. Petioles 1 to 1.5 cm. long, flattened laterally, narrowly sulcate and covered with dense, yellowish, stiff, appressed hairs. Leaf blades 20 to 40 cm. long, 10 to 15 cm. broad, elliptic-lanceolate, rounded or scarcely emarginate at base, ending in an acute tip; venation little marked on upper face, except for the hairy midrib and base of the primary veins, prominent and hairy beneath; margin smooth or obscurely sinuate, with thick tufts of short, brownish yellow hairs simulating teeth. Stipules caducous, 4.5 to 6.5 cm. long, bifid at tip, narrowly striate longitudinally and hairy outside, purple and smooth inside.

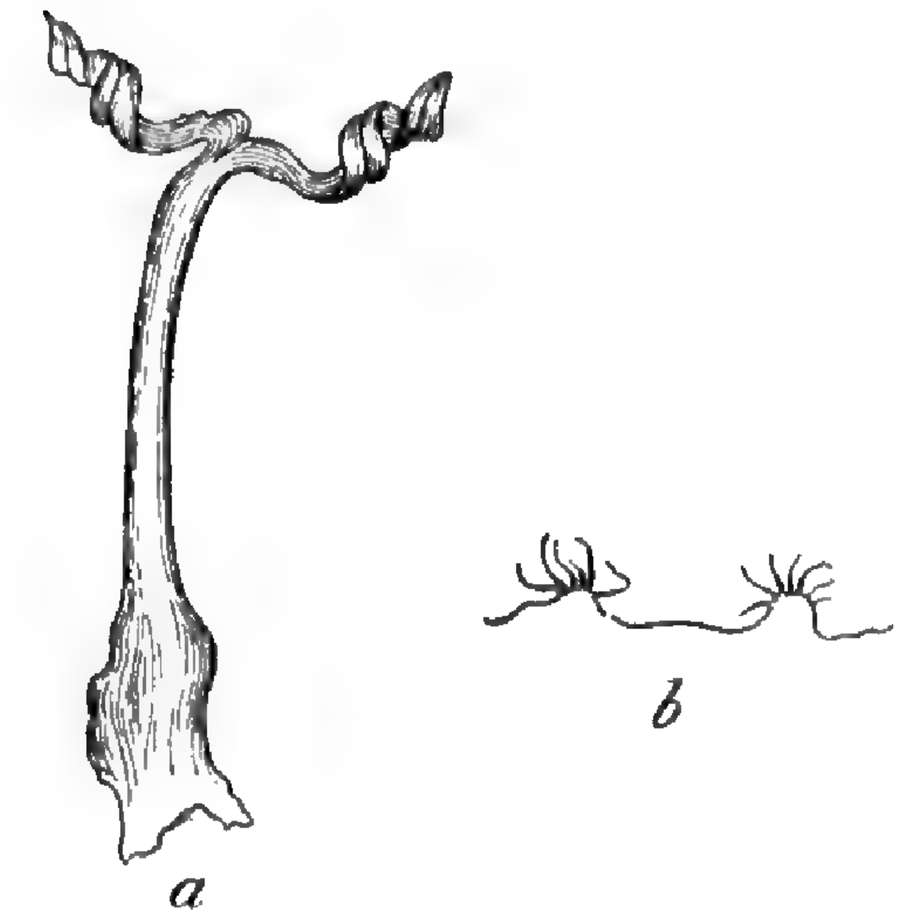



FIG. 47.—Floral details of *Castilla daguensis*. *a*, Style and stigmas; *b*, tufts of hairs on the papillæ of the stigmas. *a*, Scale 8.5; *b*, scale 85.

Receptacles of the primary male inflorescence elongate, single or two or three together, rather long-stipitate.

Complemental male inflorescence not seen, but its presence regularly indicated by one scar at the side of each infructescence.

Female inflorescence not known, except the style, this slender, about 3 mm. long, smooth, branching at its emergence from the perianth; stigmas 2 to 2.5 mm. long, narrowly lanceolate, acute, twisted; stigmatic surface covered with rounded papillæ, each crowned by a tuft of filmy, flagellate hairs.

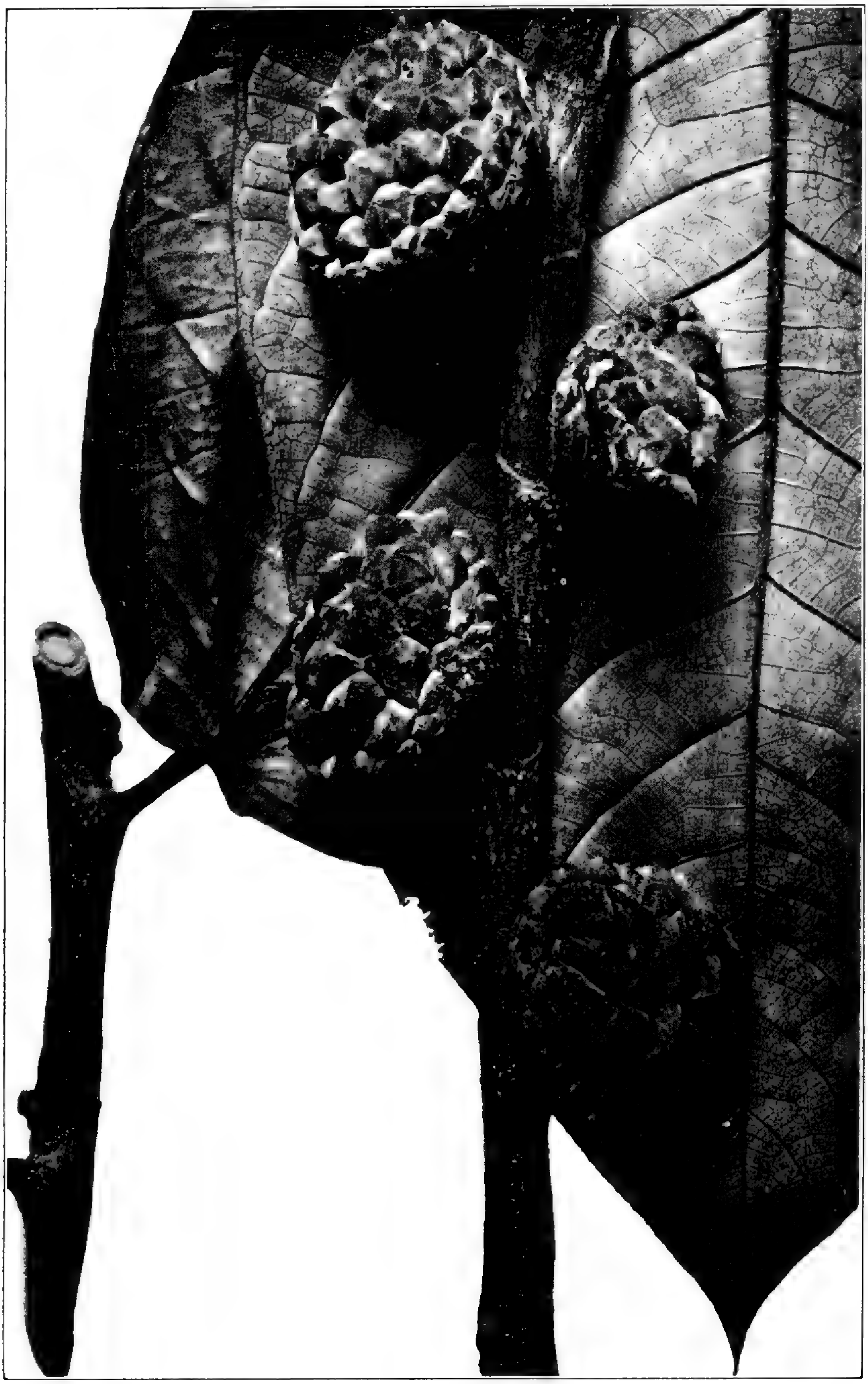
Receptacles of the infructescence sessile, rather deep, rounded underneath. Scales hairy, irregular and quite grown together. Achenia 10 to 18 on each receptacle, closely adhering, except for the broad conical hairy tips, on these the usual furrows replaced by 4 to 6 prominent keels.

Type U. S. National Herbarium no. 530791, collected by H. Pittier (no. 603) near Juntas, Dagua Valley, on the road from Buenaventura to Cali, State of Cauca, Colombia, altitude 300 meters. Flowers and fruit, December 10, 1905. These are the only specimens.

The trees are remarkable for their size; several individuals seen from the road below San José del Dagua assumed truly gigantic proportions, with a somewhat striking habit. The shaft-like trunks attained a height certainly not under, and perhaps over, 50 meters, and the divaricate limbs mostly projected horizontally, beginning about 5 meters from the ground. The tree from which the type specimens were obtained, grew near the probable upper limit of the species, and was of much lower stature, with a rounded crown and a trunk no less than 60 cm. in diameter. Another very interesting and quite characteristic feature of this species is the filmy layer that covers the stigmas. The Dagua Valley, like the adjacent part of the Pacific coast, is known for its almost ceaseless rainfall, and it is not unlikely that this film serves to retain the pollen kernels, taking the place of the sticky excretion of the stigmatic glands of other species, which would here be washed away by the continual showers.

The affinities of this species are with *C. australis* Hemsl., from which it differs in having its female receptacles sessile, as well as in the slender, rather long style, and the acute, twisted stigmas.

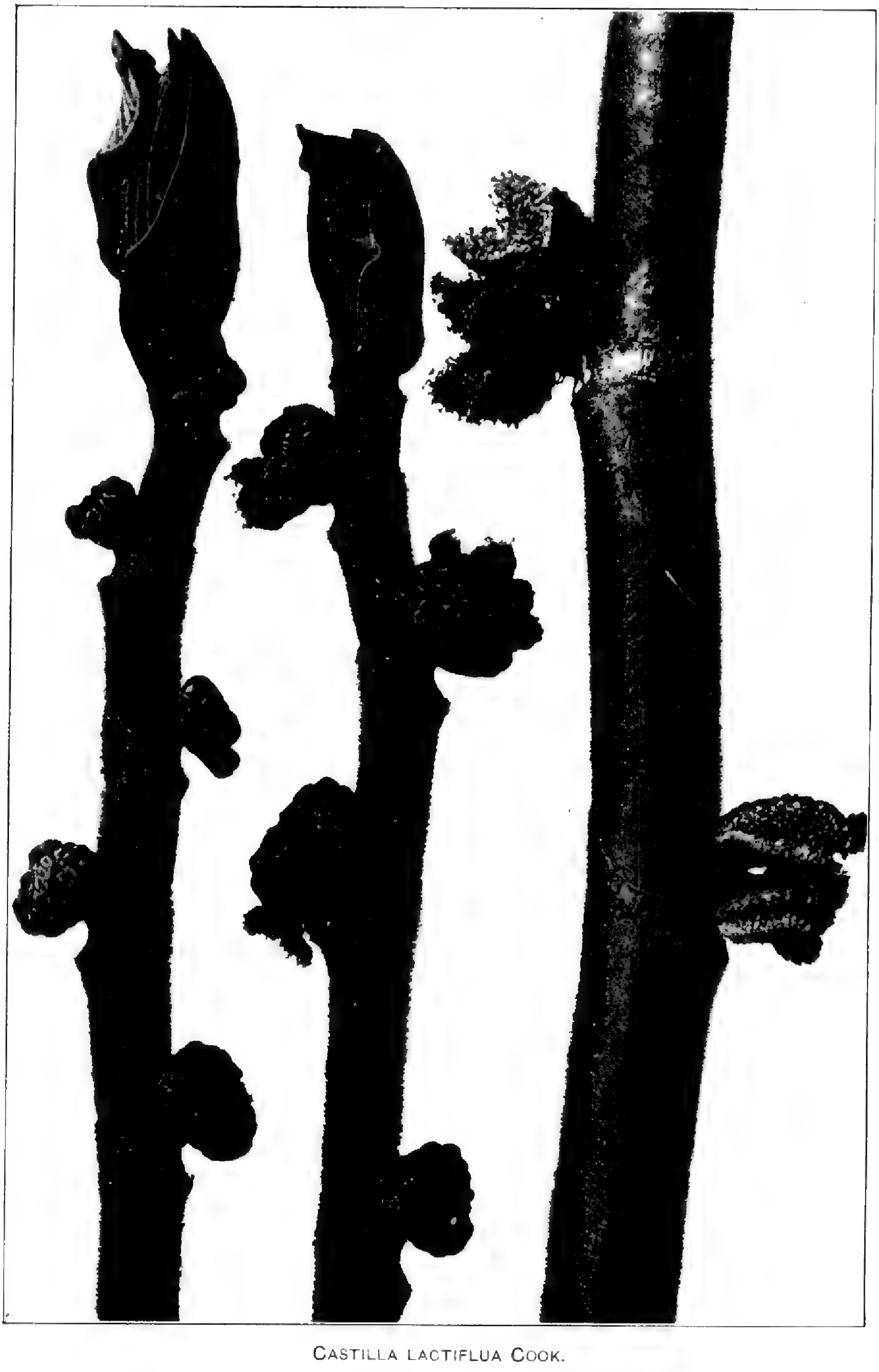
EXPLANATION OF PLATE 25.—Fruits and parts of leaves. From type specimen. Natural size.



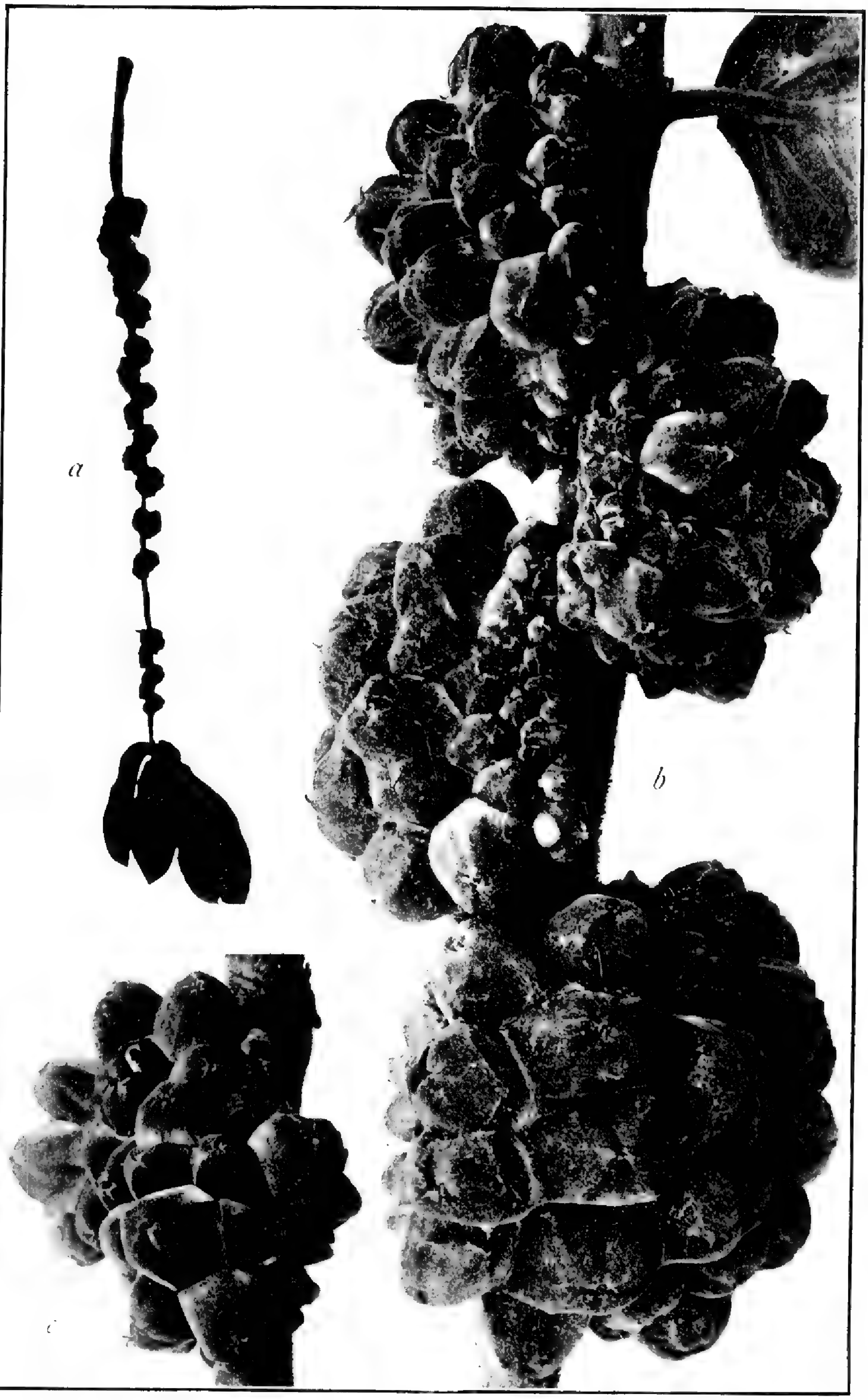
CASTILLA DAGUENSIS PITTIER.



CASTILLA LACTIFLUA COOK.



CASTILLA LACTIFLUA COOK.




CASTILLA LACTIFLUA COOK.

**5. Castilla lactiflua** Cook, Science n. ser. **18**: 438. 1903.

PLATES 26–28. FIGURE 48.

A medium-sized tree attaining 25 meters and over. Young twigs densely hairy, a thick white pith within.

Leaves rather large. Petioles 1.5 cm. long, thick, hairy. Leaf blades 30 to 45 cm. long, 10 to 15 cm. broad, deep green, rough and covered with scattered hairs above, paler and hairy beneath; midrib and the 20 to 24 primary veins hairy and little prominent on the upper face, the whole venation more marked and thickly covered with stiff hairs on the lower face; margin obscurely sinuate, with tufts of longer, erect hairs between the sinuses. Stipules caducous, 4.5 to 7 cm. long, rather broad, hairy and longitudinally ribbed outside, purplish and smooth inside.

Receptacles of the primary male inflorescence 2 or 3-geminate, small (1.5 to 2 cm. long and broad), the lobes flat, flabellate, more or less cordiform or kidney-shaped. Stipes very short (5 to 7 mm. long), bearing a few free, lanceolate-acuminate bracts. Scales numerous, in 5 to 7 imbricate rows, small (about 4 mm. long, 3 mm. broad), irregularly ovate-lanceolate, velvety, freer and narrower toward the margin. Interstaminate bracts few, irregularly shaped, hairy and ciliate, about the length of the filaments. Stamens 2.5 to 4 mm. long, glabrous, numerous, single or in clusters; filaments 2 to 3 mm. long; connective large, scutellate; anther cells narrow.

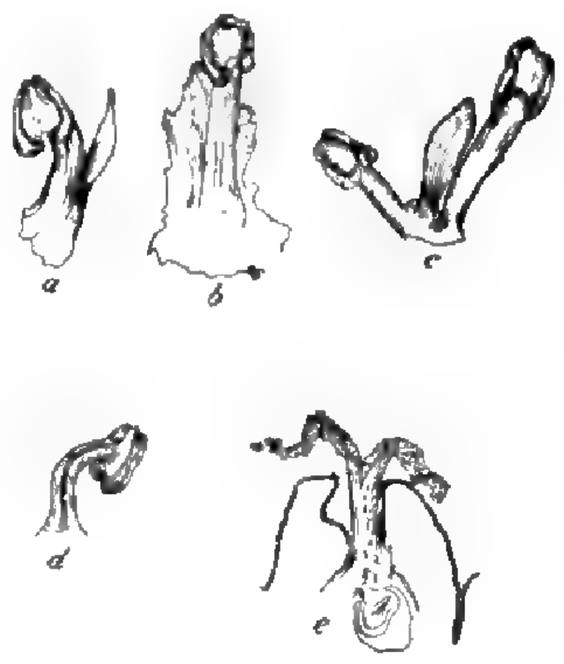


FIG. 48.—Floral details of *Castilla lactiflua*. *a–c*, Stamens of primary inflorescence; *d*, stamen of complemental inflorescence; *c*, cross section through a pistillate flower. *a–c*, Scale 3.

Receptacles of the complemental male inflorescence geminate, about 1.5 cm. long, flabellate, with a slit-like opening; stipes short (5 to 8 mm.) and rather slender, covered with imbricate, ovate-acuminate bracts; scales almost free, ovate-lanceolate (about 3 mm. long, 2.5 mm. broad). Interstaminate bracts rather few, irregularly shaped, ciliate and hairy at the tip. Stamens glabrous, 2.5 to 4 mm. long, single or in clusters; filaments rather slender; connective and anther cells as in primary inflorescence.

Receptacles of the pistillate inflorescence unusually numerous on each twig, small, sessile. Scales velvety, the basal ones broadly ovate-acuminate, the marginal ones narrower. Flowers small, concrescent at the base. Free part of perianth thick, hairy outside and inside, usually divided into 4 short, rounded lobes at the tip. Style thick and short (1.5 to 2 mm. long), partly set with stiff minute bristles; stigmas 2 to 3 mm. long, twisted, papillose.

Fruiting receptacles very shallow. Achenia 15 to 25 on each receptacle, deeply parted, scarcely sulcate; pulp orange red. (No specimens available.)

MEXICO: La Zacualpa, Chiapas, *Cook*, flowers and fruits, April, 1902 (U. S. National Herbarium no. 408562; alcoholic materials of male and female inflorescences; photographs 3967, 3968, 3971, 4323).

EXPLANATION OF PLATES 26–28.—Pl. 26, branchlets showing base of leaves and male inflorescences. Pl. 27, branchlets showing inflorescences and terminal bracts. Pl. 28, *a*, fructiferous branchlet; *b*, *c*, ripe fruits. All natural size.

*Castilla lactiflua* comes very near to *C. elastica*, but differs from it by the flat lobes of the primary male inflorescence, the flabellate complemental receptacles, the fewer interstaminate bracts, and the shallow, flat, fruiting receptacles, each with 15 to 25 seeds.

**6. Castilla costaricana** Liebm. Dansk. Vid. Selsk. Skr. V. **2**: 319. 1851.

PLATES 29–34. FIGURE 49.

A tree generally 12 to 15 meters high, but sometimes reaching 18 and 22 meters. Limbs divaricate, thick, nude. Twigs more or less hairy-tomentose, with the leaves crowded at the ends at blooming time.

Leaves deciduous, of very variable size, but rather large when fully developed. Petioles 1.5 to 2 cm. long, thick, hairy-tomentose, longitudinally plicate in dry specimens. Mature leaf blades 29 to 46 cm. long, 12 to 24 cm. broad, coriaceous, ovate, oblong, or slightly lyrate, more or less emarginate-cordate at base, abruptly acuminate, dark green and sparsely soft-pubescent above except on the hirsute midrib, paler beneath and covered with appressed hair, this thick on the midrib and primary veins and sparser elsewhere; venation regular, with 16 to 22 alternate primary veins on each side of the midrib; margin minutely sinuate, with tufts of hair, simulating teeth, between the sinuses.[a] Stipules caducous, very variable in size (4 to 15 cm. long, 3.5 to 4.5 cm. broad), narrower at base, elliptic-ovate, pointed at tip, tomentose outside, purple inside.

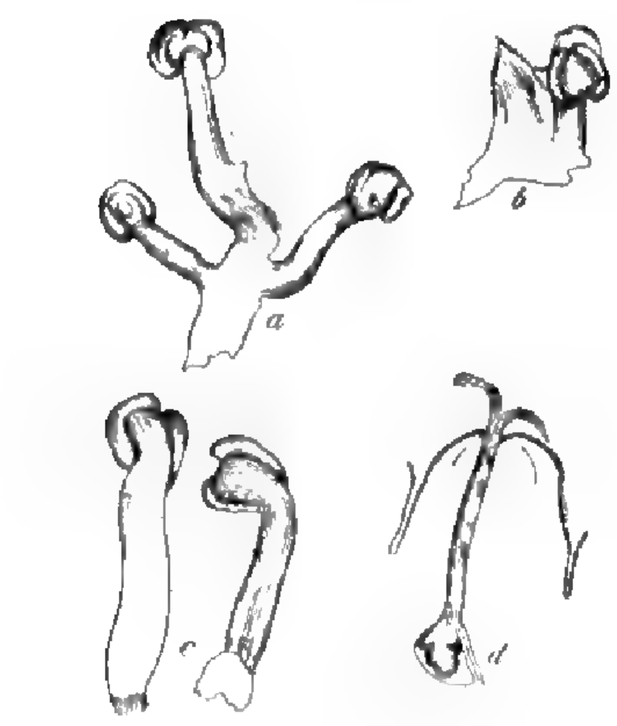



FIG. 49.—Floral details of *Castilla costaricana*. *a*, Stamens of primary male inflorescence; *b*, immature stamen of complemental inflorescence with bracteole; *c*, mature stamen of same; *d*, cross section of pistillate flower. *a–d*, Scale 3.

Receptacles of the primary male inflorescence in clusters of 4 or less, caducous, flabellate or 3-winged, but not kidney-shaped nor emarginate at base, about 2 cm. long and up to 5 cm. broad. Pedicels about 1 cm. long, pubescent, bractless at base, but with one whorl of pubescent, acute-tipped bracts near the middle. Receptacle covered outside with 6 to 8 concentric rows of ovate-acuminate, mucronate scales, those of the middle row about 6 mm. long and 5 mm broad. Interstaminate bracteoles few and of reduced size. Stamens glabrous, 4 mm. long; filaments about 2.5 mm. long, straight, cylindrical; anther cells elongate, subreniform, affixed laterally on both sides of a thick, clavate connective.

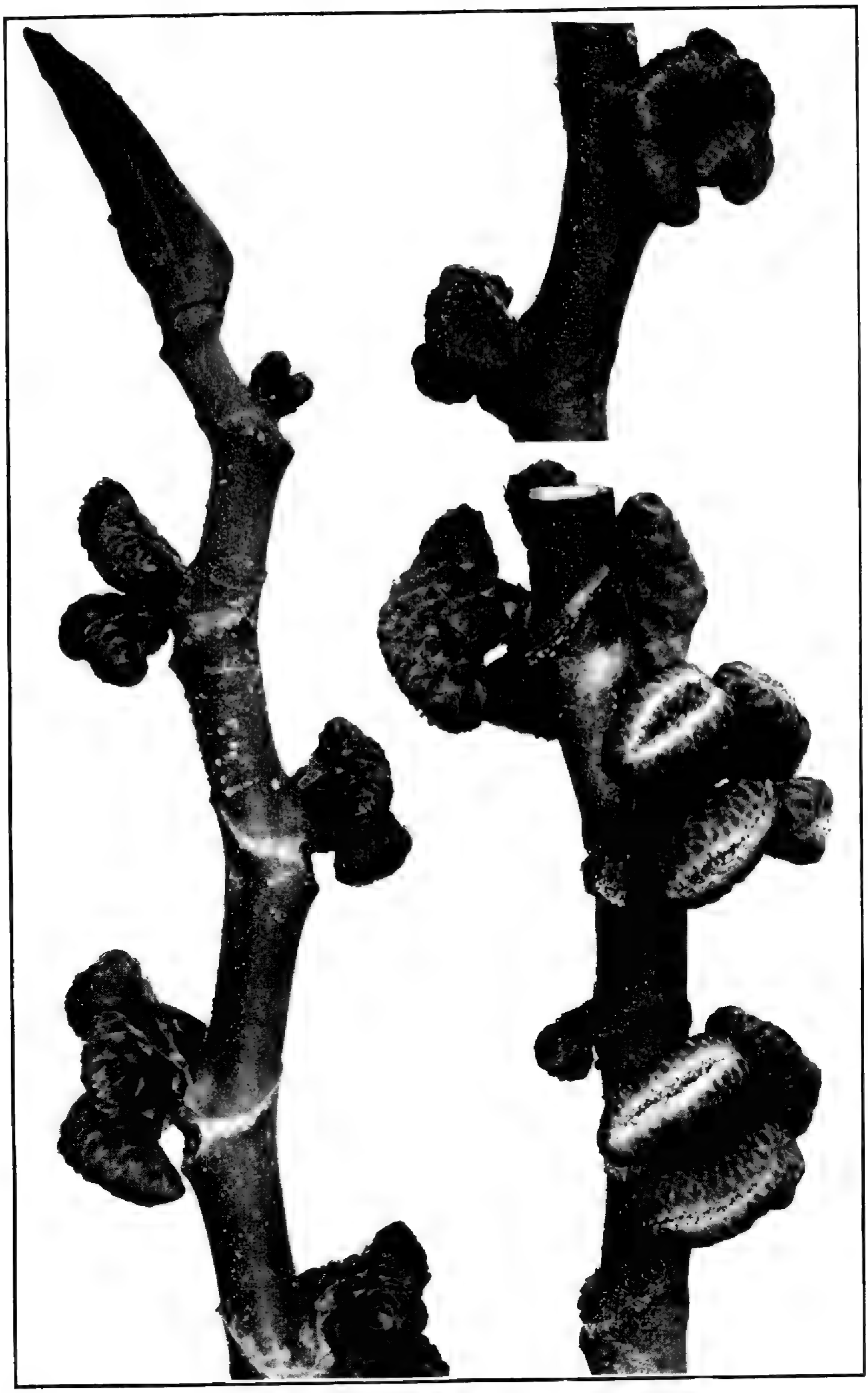
Receptacles of the complemental male inflorescence geminate, 1.5 to 2 cm. long, 1 cm. in diameter, more or less obconical and rounded at tip, insensibly attenuated into a short, thick stipe, the whole densely covered with hairy, adhering, distinctly mucronate scales, these of irregular size near the base, but about 5 mm. long and 4 mm. broad in the middle rows. Stamens 3 to 4 mm. long, glabrous, distributed in irregular lines between the diversely shaped, hairy bracteoles of the almost entirely closed cavity of the receptacle; filaments cylindrical, thick, about 2 mm. long, bent at the top; anther cells narrow, affixed to a thick connective.

Receptacles of the pistillate inflorescence shallow-cupuliform, sessile; outer scales broadly ovate-acuminate, adhering, setose, and usually arranged in 3 to 4 imbricate rows. Flowers rather small, closely adhering together for two-thirds of their length. Free part of the perianth 3 mm. long, thick, hairy, parted at the tip into 4 obtuse lobes, these about 1 mm. long. Style slender, about 2 mm.

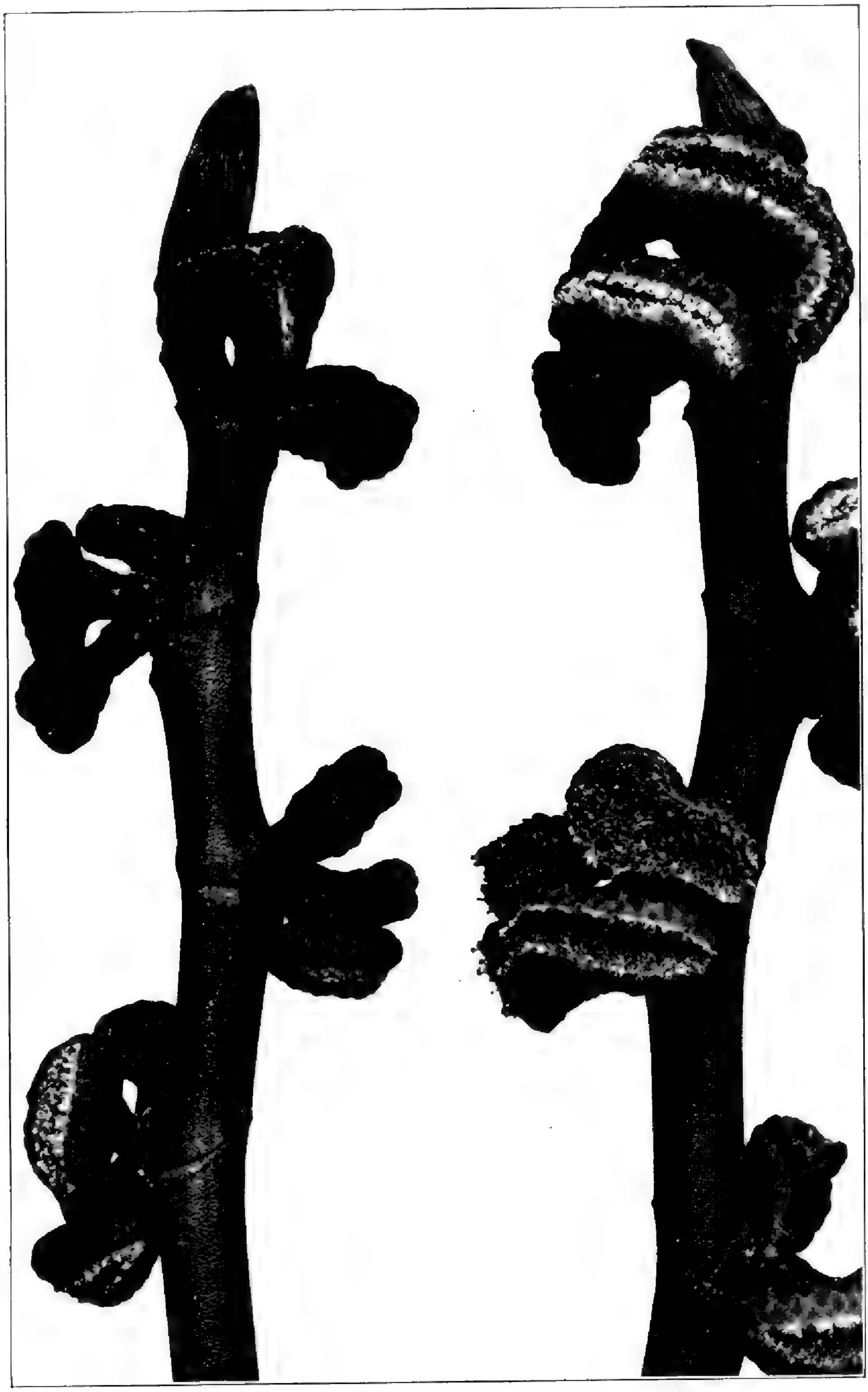
[a] On young leaves the upper surface is sparsely covered with appressed hairs, these, however, being dense on the midrib and primary veins, which thus neatly project in white or yellowish lines; beneath, the pubescence is also thicker, especially on the midrib and veins, and the tufts of hairs on the margin are quite close. These leaves are often attenuate and simply rounded or scarcely emarginate at base.



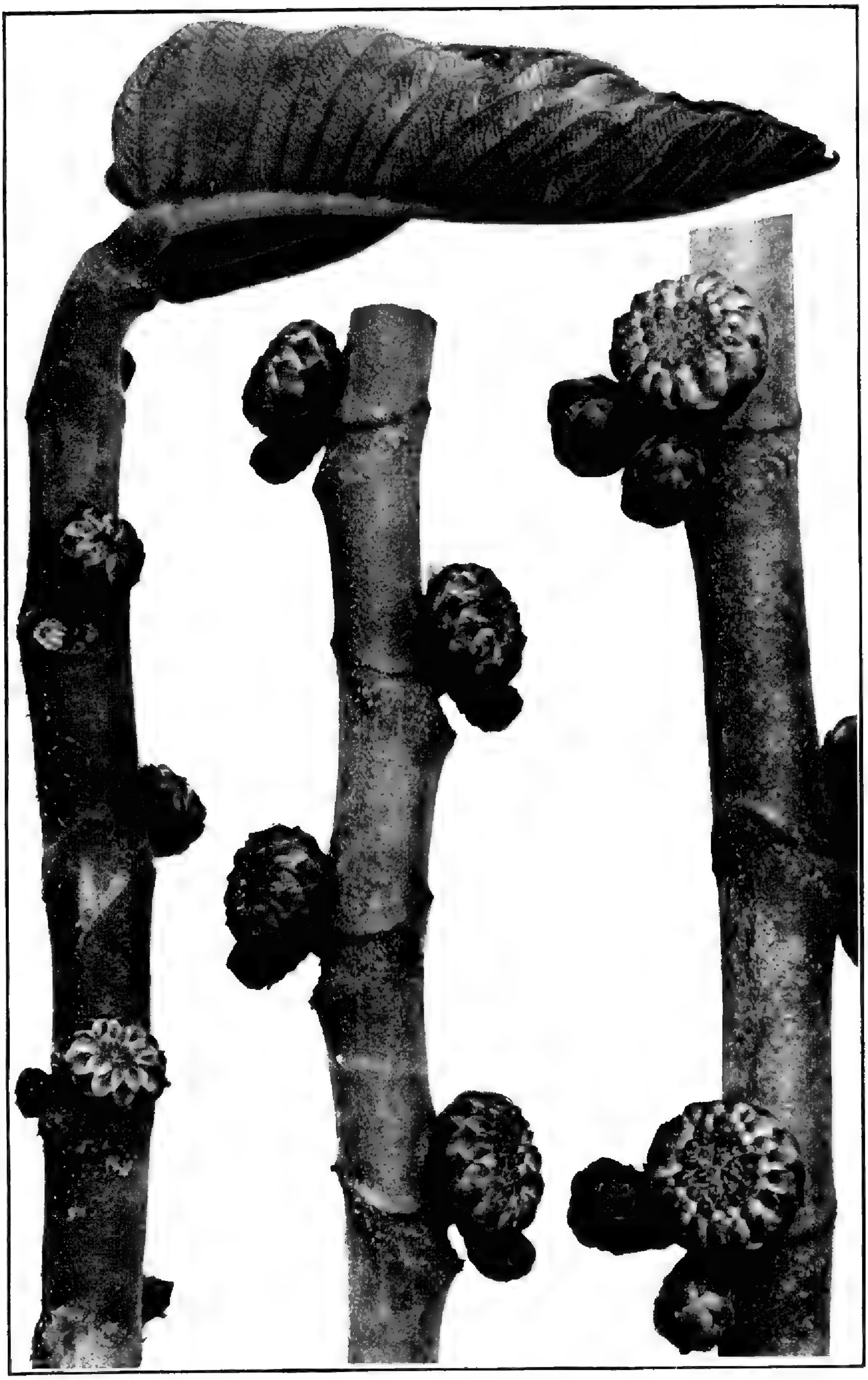
CASTILLA COSTARICANA LIEBM.



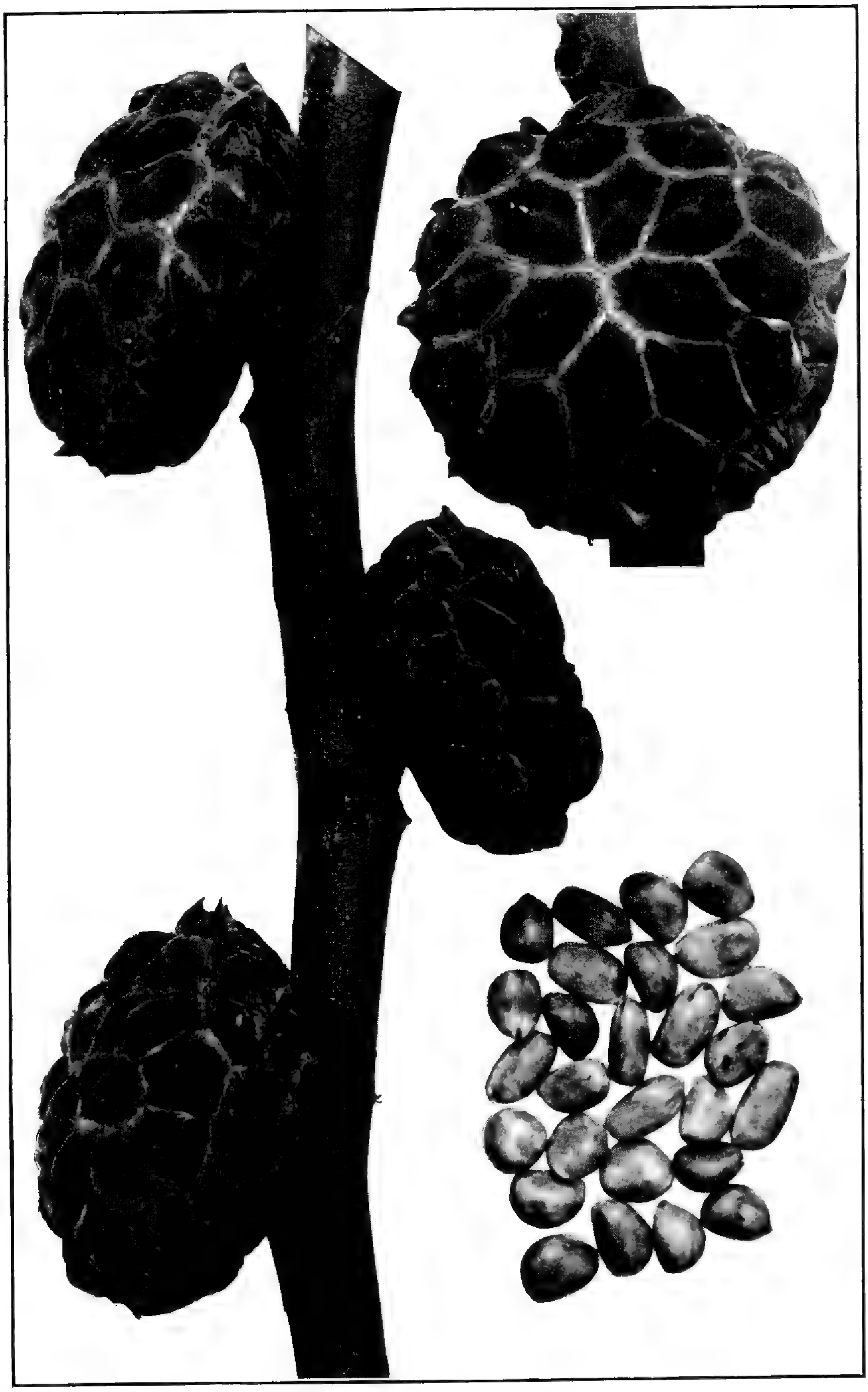
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CASTILLA COSTARICANA LIEBM.

long; stigmas greenish yellow, thin and pointed, 1.8 to 2.5 mm. long, dividing a little below the tips of the perianth and sparsely hairy on their outer face.

Fructiferous receptacles sessile, shallow-cupuliform, 5 to 6 cm. in diameter, covered outside with greatly enlarged scales. Achenia 20 to 40 to each receptacle, about 2 cm. long, pulpy and orange red at maturity, elongate and more or less tetrahedral or cuneate, contiguous through their whole length, with a rounded top, slightly depressed at the apex around the persistent style.[a] Seeds ovoid, 11 mm. long, 8.5 mm. in diameter; outer episperm white, subtransparent; arillus brownish red, smooth.

COSTA RICA: Turrialba, in the Reventazon Valley, altitude 680 meters, *Oersted; Cook & Doyle* 373, flowers and fruit, April 28, 1903; around Peralta, Reventazon Valley, altitude 300 meters, *Pittier*, young fruit, June, 1903 (Instituto fís.-geog. Costa Rica no. 16704); in banana plantations at Freehold, plains of Sta. Clara, altitude 100 meters, *Pittier*, fruit, May, 1902 (Instituto fís.-geog. Costa Rica no. 1815); Zent Farms near Port Limon nearly at sea level, *Cook & Doyle*, 475, flowers and fruit, May 2, 1903; plains of San Carlos, altitude 100 meters, *Cook & Doyle* 76, flowers and fruit, April 14, 1903.

EXPLANATION OF PLATES 29–34.—Pl. 29, a fully grown individual of *Castilla costaricana* at San Carlos, Costa Rica, called *Castilla alba* by Mr. Koschny and said to bear only male flowers. Pl. 30, primary male inflorescences at various stages of development. Pl. 31, male inflorescence at a more advanced stage; terminal buds. Pl. 32, pistillate flowers and complemental inflorescences at various stages. Pl. 33, fully mature fruits and washed seeds. Pl. 34, different view of mature fruit; detached drupes; bases of leaves.

Liebmann's specific diagnosis refers entirely to characters taken from the leaf, which experience has shown to be quite inconclusive, so as to justify in some degree the rejection of this species by Hooker. Quite vague, too, and somewhat perplexing, is this further enumeration of the differential characters, given as a supplement to the Latin description: "It resembles very much *C. elastica*, from which it differs by the dimensions and more especially by the nature and color of the pubescence." With reference to the diagnosis it has been found that there is no sensible difference in the size of the leaf in *C. costaricana*, *C. nicoyensis*, and the Motzorongo specimens, which we infer to belong to *C. elastica;* numerous measurements have shown also that the petiole is really longer on the average in Liebmann's species and the characters derived from the pubescence are not constant enough to be taken into consideration. As to the color, it is to be noted, namely, that it seems to be grayish in specimens grown in the sunny open, and fawn-colored (fulvous) only on trees located in the shady forest.

Nevertheless a close examination of the inflorescences and of the fruit shows that there are in their respective parts structural differences that fully support the maintenance of the Costa Rican type as a distinct species. In the primary male inflorescence the receptacles are usually broader and covered with larger scales, the interstaminate bractlets are few and little developed and never occur on the filaments, and those which are present are rounded and fully differentiated from the bractlets. The styles are slender, proportionately longer, and glabrous; the stigmas are two, never more, short and hairy on the outer or lower side. The fructiferous receptacles are on the average smaller, with only 18 to 31 achenia, these completely immersed. These peculiarities, taken together, are certainly more than sufficient to distinguish Liebmann's species from all its congeners.

[a] Many of these achenia are seedless and formed of a compact, reddish, pulpy mass, with a perfect exterior appearance.

The range of *C. costaricana* is as yet undetermined, but seems to be included within narrow limits. So far as it is known the species is restricted horizontally to the northeastern watershed of Costa Rica and the adjoining districts of Nicaragua and Panama, the climate of which is characterized by perennial rains and almost perpetual dampness of both soil and air. The vertical range is from the sea-level to an altitude of nearly 1,000 meters, with the peculiarity, noticed by all *hulcros*,[a] that the rubber contents of the latex and the quality of the product decrease with the distance above the lower level. It has also been observed that the tree does not thrive in soils impregnated with salt water or containing an excess of sand, nor when too directly exposed to strong sea-breezes; lastly, it is never met with in or in close proximity to the coast swamps.

*Castilla costaricana* is par excellence a tree of the virgin forest—ein Urwaldbaum. While its trunks attain there a great length and a considerable girth, it becomes prematurely old in the open, where it never has the healthy appearance almost invariably noticed in the lofty forest specimens. Like other trees of the Tropics, the surface of the bark is covered with dense colonies of lichens, the color of which varies with the intensity of the light. This fact has given rise to the belief that there are several varieties of this species, distinguished mainly by the color of the bark and also by the correlative fluidity or richness of the latex. Thus the trees that grow in the thickest forest have also the darkest bark and their latex is very thin and easily collected, but contains less rubber; those which grow in full sun exposure have a light colored bark and a very thick, rapidly coagulating latex.

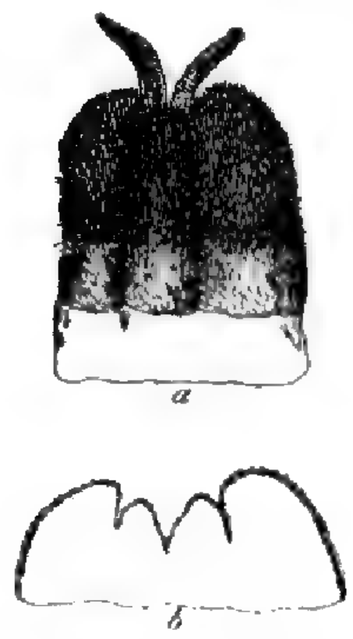



FIG. 50.—Female flower of *Castilla guatemalensis*. *a*, Flower; *b*, top of perianth open and showing lobules. Scale 3.

**7. Castilla guatemalensis** Pittier, sp. nov.

PLATES 35–39. FIGURES 50, 51.

Medium-sized tree; limbs divaricate and spreading. Flowering twigs long, more or less pendulous, densely covered with yellowish, strigose hair, filled with a thick white pith, circled outside by the scars of the stipules. Internodes 3 to 7 cm. long.

Leaves congregated at the ends of the younger twigs, petiolate, stipulate, caducous. Petioles 1 to 2.5 cm. long, thick, densely hairy-strigose. Leaf blades 23 to 46 cm. long, 10 to 18 cm. broad, elliptic, sometimes slightly lyrate, cordate at the base with very narrow sinus, abruptly acuminate, rough and covered with scattered hairs above, tomentose beneath; midrib and the 19 primary veins inconspicuous and sparsely hairy above, prominent and hairy-tomentose beneath; margin obscurely sinuate, with tufts of hairs between the sinuses.[b] Stipules about 6 cm. long, 2 cm. broad, lanceolate, clasping, longitudinally ribbed and tomentose outside, smooth and purplish inside.

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[a] Rubber collectors.

[b] A leaf specimen, collected at the Chocon River Plantation (Department of Izabal, Guatemala) by Sereno Watson, and now in the Gray Herbarium, is remarkable by its petiole measuring 8 cm., by the relatively little developed tomentum on the petiole, midrib, primary veins, and lower face, and by its obscurely dentate margin. The general texture of this leaf is also lighter and it is presumable that it grew in the shade and on a seedling or a young tree. The same applies to *Eggers* 15163, belonging to another species growing in Ecuador, with a petiole nearly 5.5 cm. long and a thin blade with distinctly dentate margin.

Receptacles of the primary staminate inflorescence stipitate, flabellate, in axillary clusters generally of 6, geminate, the two exterior pairs flowering first. Basal bracts small (3 to 4 mm. long), ovate-acuminate, hairy outside, smooth inside, involucrate. Stipes about 2 cm, long, hairy and bearing a few more or less developed bracts. Lobes of receptacle 2 to 3 cm. long, 2 cm. broad, kidney-shaped, flat or reflexed. Scales in 5 or 6 imbricate rows, 2 to 3 mm. long and broad, ovate-acuminate, hairy. Interstaminate bracts small (about 1 mm. long), ovate-lanceolate or acuminate. Stamens 2 to 4 mm. long, glabrous and numerous; filaments rather slender; connective thick, papillose on the upper face; anther cells apparently broader than in the other species.[a]

Receptacles of the complemental staminate inflorescence geminate, stipitate, claviform, 2 to 2.5 cm. long, with a slit-like opening. Stipes 1 to 1.5 cm. long, thick, pubescent, squamose. Scales broadly ovate (2.5 to 4 mm. long, 4 to 6 mm. broad), pubescent, almost free to the base. Interstaminate bracts hairy on both faces and ciliate, either simple and narrow, or broad and diversely laciniate. Stamens glabrous, 4 to 5 mm. long.

Receptacles of the pistillate inflorescence sessile or borne on a very short, thick peduncle, cupuliform, covered outside by about 5 rows of imbricate scales, ovate-acuminate, hairy outside. Perianth about 3 mm. long, free to the base, longitudinally 4 or 5-sulcate, divided at the tip into 4 or 5 uneven, more or less acute lobes. Style 1.5 to 2 mm. long, rather thick, more or less covered with stiff hairs at the base and along one side; stigmas 2, seldom 3, 2 to 4 mm. long, linguiform, papillose, purplish or greenish yellow, semierect and more or less twisted.[b]



FIG. 51.—Floral details of *Castilla guatemalensis*. *a*, Stamen, front view, showing large connective; *b*, stamen, back view; *c*, group of stamens at various stages, with bracteoles also; *d*, *d'*, *d''*, styles. Scale 3.

Fruiting receptacles very much enlarged and reaching often more than 5 cm. in diameter. Achenia 14 to 22 on each receptacle, 18 to 20 mm. long, 12 to 15 mm. in diameter, orange-red at maturity, scarcely concrescent at the base, but simply pressed together without losing their individuality, and always free at the apex. Seed ovoid with more or less flattened sides, 11.3 mm. long, 8.4 mm. in diameter; episperm white, arillus brown.

Type in the U. S. National Herbarium, nos. 408077–8, collected by O. F. Cook (no. 295), March 29, 1902, at Secanquim, Alta Verapaz, Guatemala, altitude 550 meters.

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[a] The foliaceous radial crests along which the stamens are usually inserted are here little and irregularly developed, being at times narrow, either smooth or ciliate, and at other times broader and with triangular or rounded, ciliate teeth; bracteoles are never seen high on the filaments; all transitional stages between a bract and a perfect stamen can be found on one receptacle. The stamens develop successively from the base of the lobe toward its periphery, the basal becoming fully mature and having their anther cells open and empty while the marginal ones are still very short, with the connective inflexed on the filament.

[b] In Secanquim dry materials, the pistil had taken the appearance of a foliaceous organ, opening by a side slit, and then forming a bilobulate or trilobulate leaflet, with a distinctly marked midrib. In the specimen with two styles the hairy external zone was found to correspond with the broad interlobular rib.

MEXICO: Lumija (Tabasco), *Cook*, female flowers and fruits, June 25, 1906 (alcoholic materials); Hacienda Kanachen (Yucatan); *Schott* 777, female flowers, March, 1866; Salto de Agua (Tabasco); *Cook* 150, leaves, June, 1906 (U. S. National Herbarium no. 593979).

GUATEMALA: El Crique, Alta Verapaz, *Cook* 803, 807, flowers and fruit, April 4, 1902 (U. S. National Herbarium nos. 408520–1, 408526–8; photographs 3784, 3794–3800, 3802–3; Las Tinajas near El Crique, Alta Verapaz; *Cook* 817, April 4, 1902 (U. S. National Herbarium no. 408540); Secanquim, Alta Verapaz, altitude 550 meters, *Cook* 42, April 19, 1904 (U. S. National Herbarium, nos. 593980–2; alcoholic materials of leaves, flowers, and fruits; photographs 7201, 7214, 7217, 7287–90); Panzos (Alta Verapaz); *Cook* 10, leaves, flowers, and fruits, April, 1904 (U. S. National Herbarium, nos. 593983–4; alcoholic materials; photographs 7133–8, 7142–7; Escuintla, altitude 300 meters; *Donnell Smith* 2506, young fruits, February, 1892; Chocon River Plantation, Alta Verapaz; *S. Watson*, March, 1885, leaf of a seedling (Gray Herbarium).

EXPLANATION OF PLATES 35–39.—Pl. 35, a young *Castilla guatemalensis* at El Crique, showing habit; U. S. National Herbarium photograph 3784. Pl. 36, *a*, clusters of primary male inflorescences; *b*, another cluster, showing long stipes and insertion on branchlet; *c*, complemental inflorescence, after taking away the female receptacle; *d*, female receptacle with the accompanying complemental male receptacles; *e*, female receptacle inserted on branchlet; on the left are seen the scars left by the leaf (below) and by the complemental male inflorescence (above); *f*, a ripe fruit; *g*, seeds, some with the testa partly cut to show arillus. Pl. 37, flowering branchlets, the one on the left with primary male inflorescences, the one on the right with complemental and female inflorescences. Pl. 38, fruits at various stages, none ripe. Pl. 39, fructiferous branchlets, at Secanquim.

**8. Castilla panamensis** Cook, Science n. ser. **18**: 438. 1903. FIGURE 52.

A medium-sized or large tree, rather low and spreading, as seen in the open. Limbs divaricate, obliquely ascending, nude. Bark of young twigs longitudinally plicate (in dry specimens) and densely hairy.

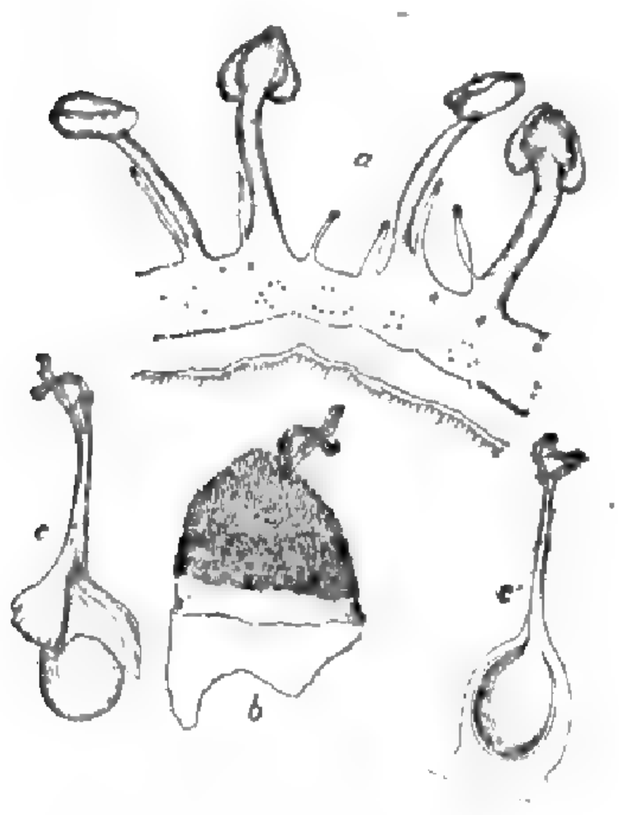
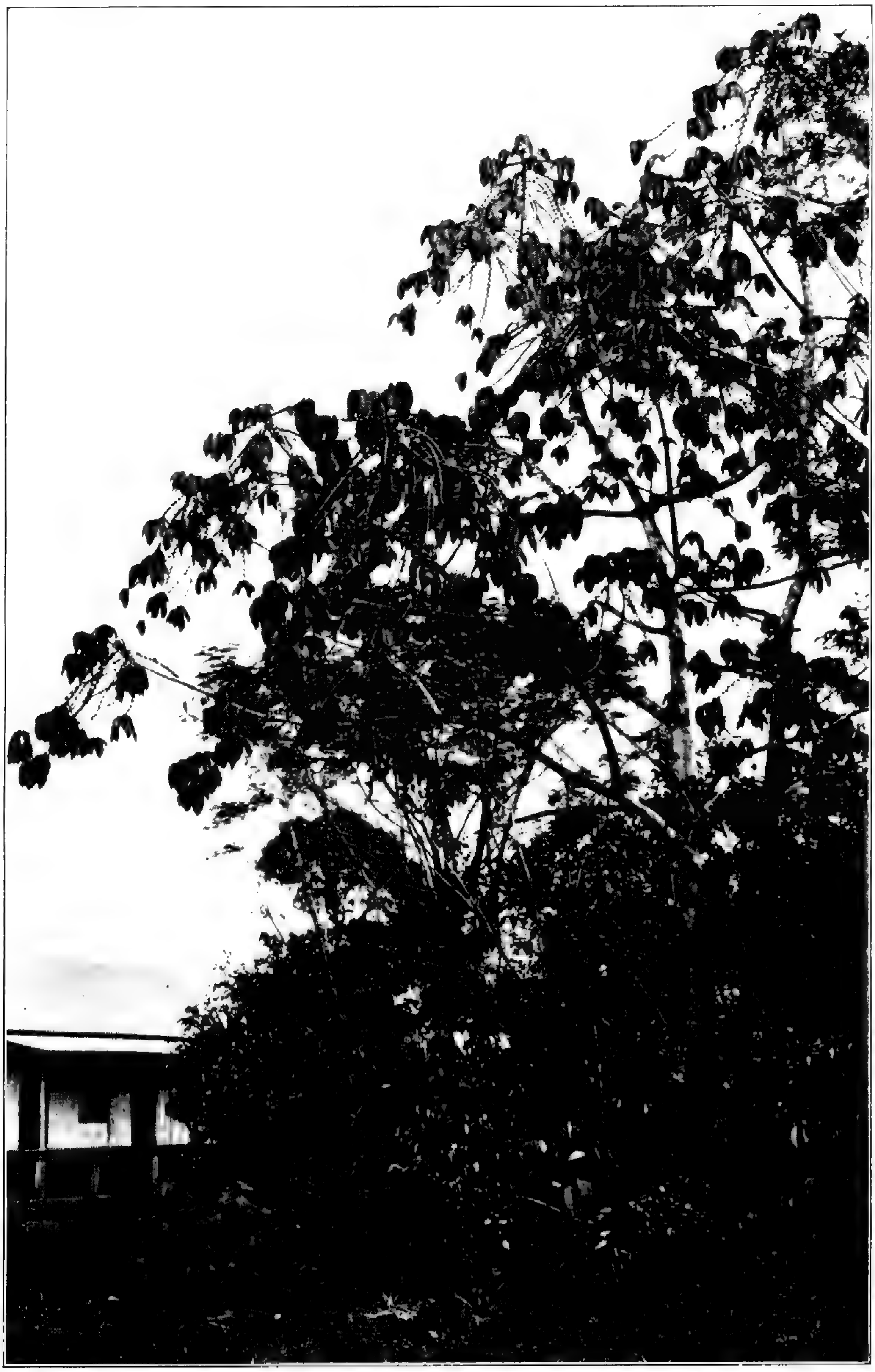


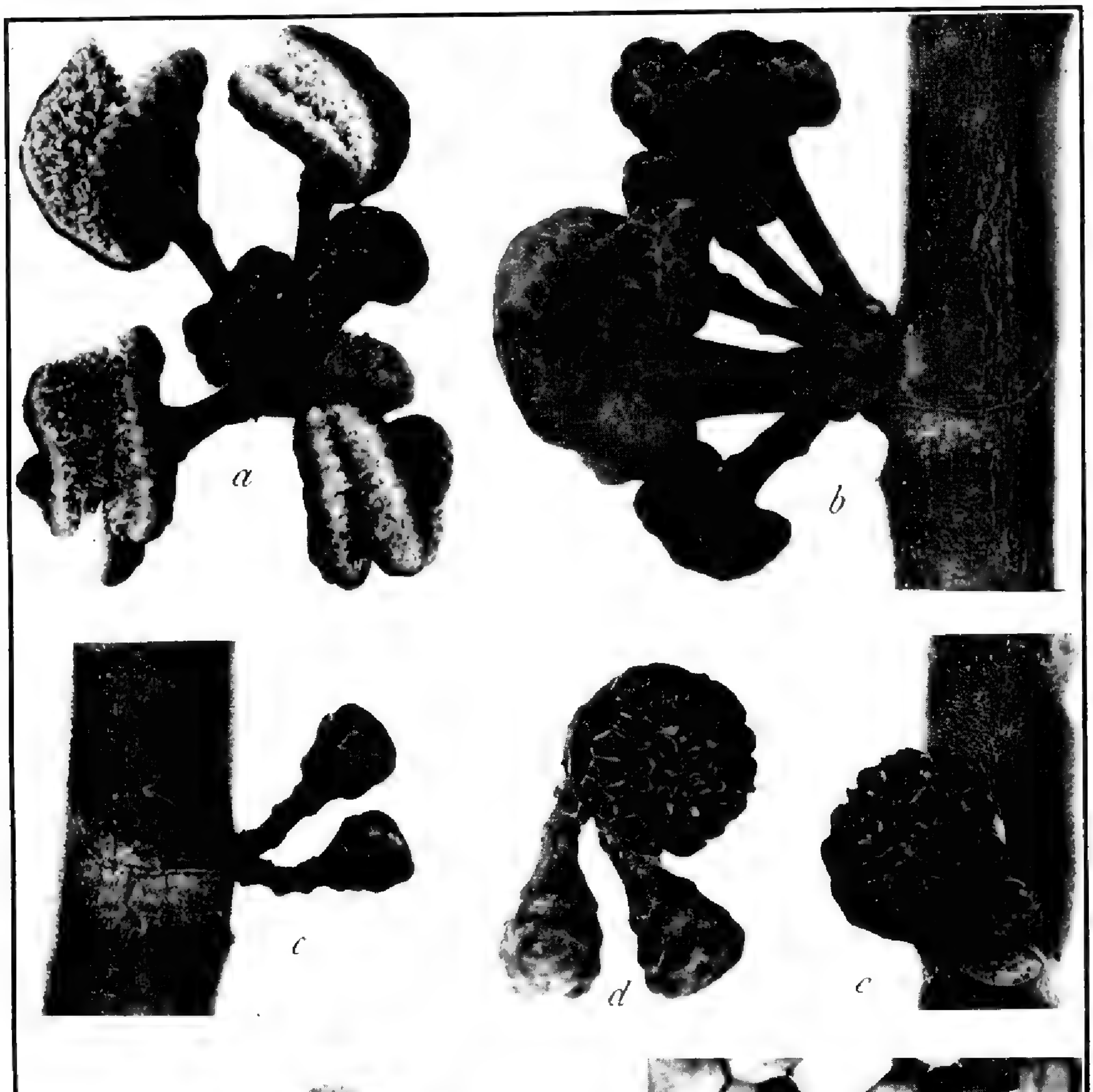

FIG. 52.—Floral details of *Castilla panamensis*. *a*, Transverse section of primary male inflorescence; *b*, male flower; *c*, *c*, style and ovary. *a–c*, Scale 3.

Petioles thick, densely hairy, 0.8 to 1.2 cm. long. Mature leaf blades ovate-elliptic, cordate at base, more or less rounded above and abruptly contracted into a narrow acumen nearly 2 cm. long, 20 to 30 cm. long, 10 to 12 cm. broad, dark green, rough and sparsely pubescent above except on the hairy midrib, paler or rufescent below, with the midrib and primary veins hairy, and the finer veins and anastomosis more sparsely hairy-pubescent; 23 to 27 primary veins on each side of the midrib; margin obscurely sinuate, the intermediary teeth marked by tufts of stiff hairs. Stipules caducous, at times short and broad (3.5 by 3.5 cm.), at times longer and narrow (6 by 2.5 cm.), pubescent outside, smooth and of the same pale brown color inside.

Receptacles of the primary male inflorescence in clusters of 4, caducous, flabellate, more or less kidney-shaped, very uniform in size, about 1.4 cm. long and 2 cm. broad. Pedicels over or under 1 cm. long, with a calyx-like bracteal involucre, 8 mm. long, at the base. Receptacles covered outside with 6 to 8 concentric rows of ovate-acuminate, imbricate, dark-tipped scales. Stamens glabrous, about 4 mm. long, irregularly distributed, isolated along the radial blades or in clusters at the ends of the lateral branches of the same, and with or without bractlets; blades and bractlets ciliate-pubescent; filaments 2.5 to 3 mm. long; anthers ovoid or subreniform; connective thick.



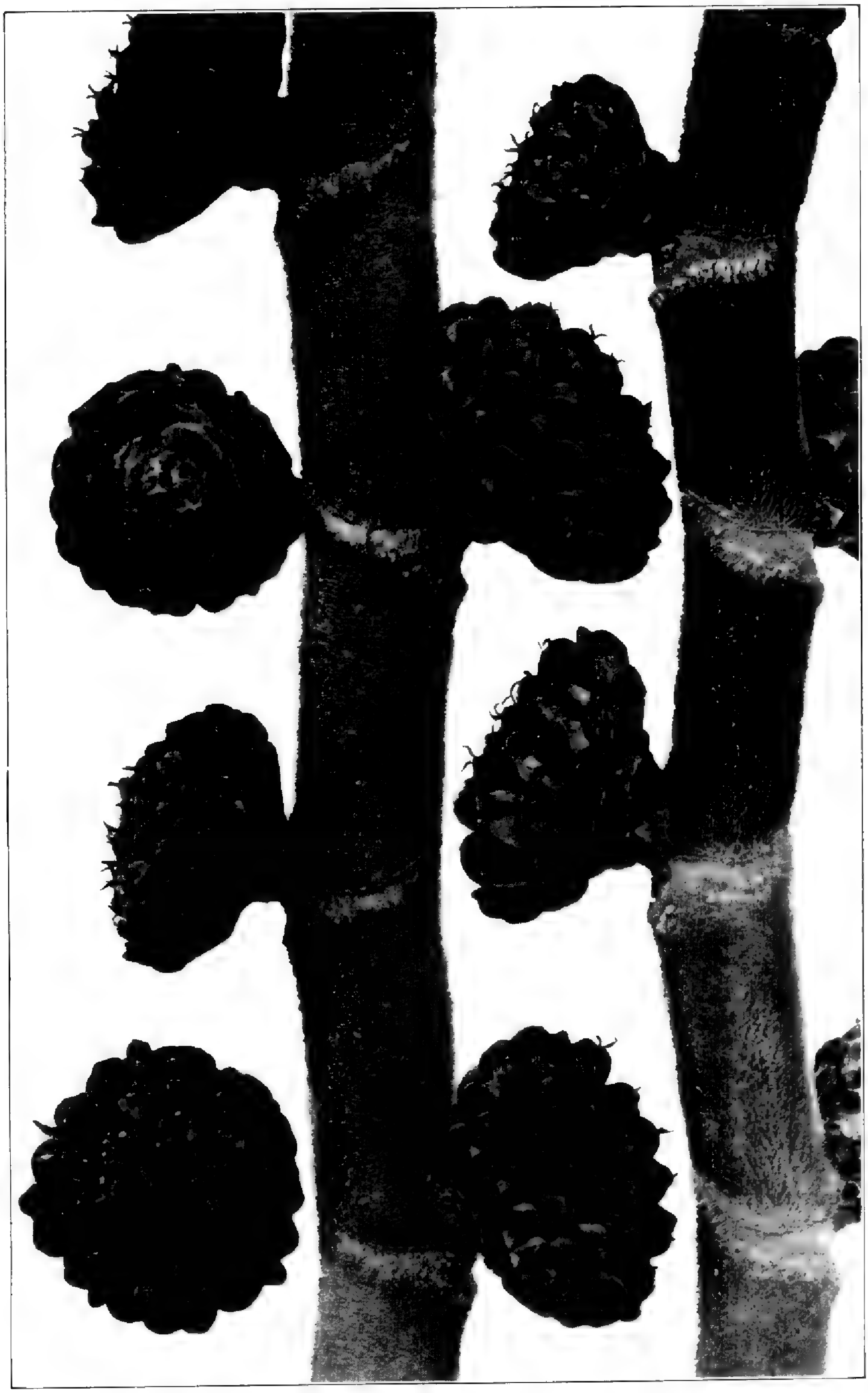
CASTILLA GUATEMALENSIS PITTIER.




CASTILLA GUATEMALENSIS PITTIER.



CASTILLA GUATEMALENSIS PITTIER.



CASTILLA GUATEMALENSIS PITTIER.



CASTILLA GUATEMALENSIS PITTIER.

Receptacles of the complemental male inflorescence geminate, 1.5 to 2 cm. long, 1.3 cm. in diameter, broadly obconical and attenuate into a rather long and slender stipe, provided at the base with a short bracteal involucre. Scales broad, short, and with dark tips. Dehiscence slit-like. Blades, bracteoles, and stamens as in primary inflorescence.

Receptacles of the pistillate inflorescence rather deeply cupuliform and with the marginal bracts still strongly incurved at the time of anthesis. Outer scales very broad, rounded at tip, rarely mucronate, tomentose, imbricate in 3 or 4 rows. Flowers 3 to 4 mm. long, free almost from the base. Free part of the perianth hairy, not lobulate at tip, closed but for a small round aperture giving egress to the style. Ovary immersed in the receptacle. Style slender, about 2.5 mm. long, entirely glabrous; stigmas 1.5 to 2 mm. long, linguiform, dividing a little below the tip of the perianth, papillose-rugose on the inner (upper) face, smooth outside.

Fructiferous receptacles sessile, deep cupuliform, 4 to 5 cm. in diameter, the outer scales large, partly confluent and indistinct. Achenia 12 to 16 to each receptacle, about 2 cm. long, contiguous through their whole length, with a prominent, pyramidal, acute tip. Seeds more or less ovoid, 12 to 13 mm. long and about 9 mm. thick; episperm transparent; arillus (in alcohol) brownish.

PANAMA: Around the hospitals at Ancon, Canal Zone, Mrs. K. D. Gaillard, flowers and fruit, February, 1910 (U. S. National Herbarium no. 593174).

The above description is based on the fresh material kindly sent from Ancon by Mrs. Gaillard, but the first idea of the specific status of the Panama type was gathered from the comparison by Mr. O. F. Cook of Hooker's plate [a] with material of the other Central American species. Our specimens are found to possess all the characters attributed by Mr. Cook to his *C. panamensis*, and to agree also fairly with Hooker's descriptions and illustrations, so that there is little doubt left as to the identity of our tree with the one grown in Ceylon from seeds or cuttings collected on the Isthmus.

**9. Castilla nicoyensis** Cook, Science n. ser. **18**: 438. 1903.

PLATES 40–42. FIGURE 53.

A medium-sized tree, 10 to 20 meters high. Limbs divaricate, ascending, or horizontal. Floriferous twigs covered with a dense coating of rather long, brownish hairs, longitudinally striate when dry and filled with a thick, white pith.

Leaves of medium size, deciduous. Petioles 1 to 2 cm. long, thick and densely hairy. Leaf blades 20 to 46 cm. long, 10 to 20 cm. broad, more or less cordate-emarginate at base, acuminate at tip, covered on the upper face with sparse hair, this thicker on the midrib and primary veins, paler and hairy, especially on the veins, beneath. Nervation regular, prominent beneath. Margin distinctly dentate-sinuate, with tufts of hair on the teeth.[b] Stipules caducous, rather small (5 to 7 cm. long, 2 to 3 cm. broad), lanceolate-acuminate, purplish and smooth inside, hairy-tomentose outside, with a whitish marginal line.

Receptacles of the primary male inflorescence caducous, geminate, usually two pairs in each axil, opening out when mature into a flat disc, 2.5 to 3.5 cm. in diameter. Stipes 1.5 to 2 cm. long, rather slender, hairy, provided with free, triangular bractlets. Scales of receptacles in 5 or 6 rows, rather large (about

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[a] Trans. Linn. Soc. II. **2**: 209. *pl.* 27. 1885.

[b] The young leaves are dark green and sparsely hairy above, densely hairy-tomentose beneath; the indentation of the margin is scarcely noticeable, and the base is often only rounded or scarcely emarginate.

5 mm. long, 3 mm. broad), ovate to ovate-lanceolate, with free tips. Interstaminate bracts very few, small, ovate-lanceolate or acuminate, ciliate. Stamens glabrous, numerous and very close together, 3 to 4.5 mm. long; filaments 2.5 to 3 mm. long, slender; anther cells narrow, attached laterally on a thick, expanded connective.

Receptacles of the secondary staminate inflorescence single or geminate, hairy, 1.8 to 2.8 cm. long, clavate, rounded and scarcely open at the tip. Stipes thick, 1 to 1.2 cm. long, provided with 1 to 3 irregular whorls of scale-like bracts, with dark, free, scarious tips. Scales of the receptacle broadly rounded, acuminate, also with free, dark tips. Interstaminal bracts absent. Stamens 3.5 to 6.5 mm. long, glabrous, distributed in irregular lines connected by a thin membranous band; filaments cylindrical, rather slender, 2 to 4 mm. long; connective large, scutellate; anther cells narrow. Receptacle of the pistillate inflorescence sessile, shallow, covered outside with 4 or 5 rows of hairy, concrescent, imbricate scales, these broadly ovate-acuminate near the base, lanceolate-acuminate near the margin. Flowers 5.5 to 6 mm. long, half immerged in the receptacle. Free part of the perianth thick, hairy outside and inside, irregularly 3 to 5-toothed. Style rather thick, about 1 mm. long; stigmas yellow, elongate, narrowly lanceolate, spirally twisted at the ends.

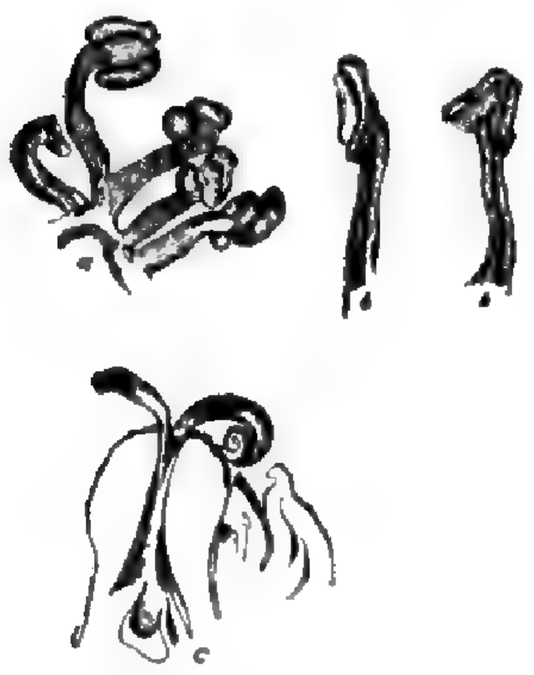


FIG. 53. — Floral details of *Castilla nicoyensis*. *a*, *b*, Stamens at various stages; *c*, longitudinal section of female flowers. Scale slightly less than 3.

Fructiferous receptacles cupuliform but very shallow, 4 to 5 cm. in diameter, their scales broadly ovate-acuminate, the marginal ones thick, pointed, half-free, and corresponding to aborted flowers. Achenia 10 to 15 to each receptacle, orange red at maturity, adhering together for their lower half, the upper half being free, more or less pyramidal, and slightly grooved.[a] Seeds roundish, 9.31 mm. long, 8.13 mm. in diameter, more or less deformed by compression;[b] inner pellicula light cacao brown; embryo small, conical, bifid, about 1.5 mm. long.

COSTA RICA: Around Nicoya, at an altitude of about 300 meters, *Tonduz*, flowers, February, fruit, May, 1899 (Instituto ffs.-geog. Costa Rica no. 13723); *Cook & Doyle*, 673, flowers and fruit, May 22, 1903; *Pittier*, flowers and fruit, January, 1904 (U. S. National Herbarium no. 578510); Colonia Maceo, at about 100 meters altitude, *Cook & Doyle* 640; May 21, 1903, flowers and fruit; Las Huacas, altitude, 900 meters, *Cook & Doyle* 730, leaves only.

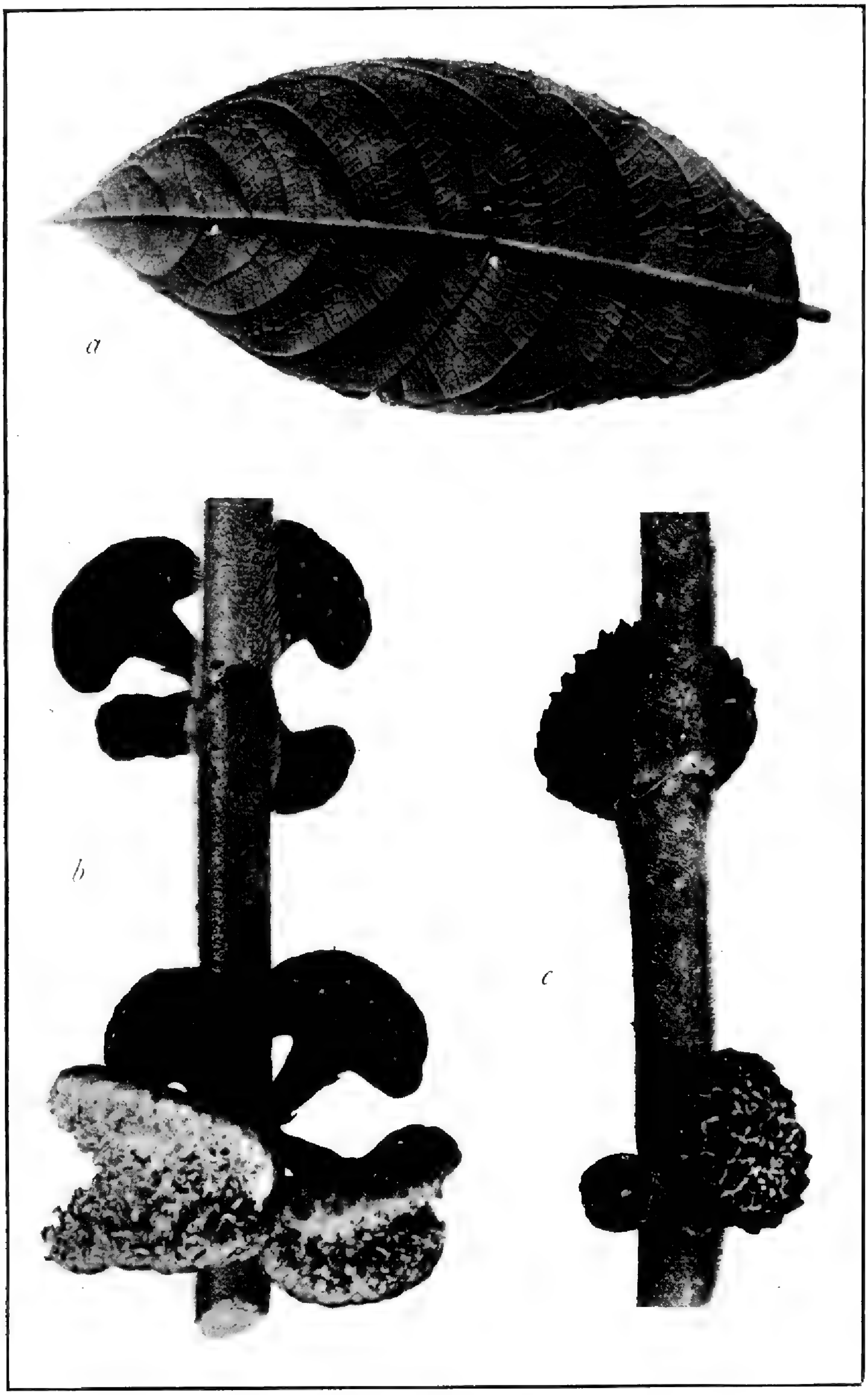
EXPLANATION OF PLATES 40–42.—Pl. 40, *a*, young leaf of a seedling, showing serrate margin; *b*, primary male inflorescence; *c*, part of branchlet showing complemental and pistillate inflorescences. Pl. 41, base of leaves and complemental and pistillate inflorescences. Pl. 42, fruits, terminal buds, and base of leaves. All natural size.

This species has, in common with *C. elastica*, the long-stipitate male receptacles, but it differs from that species by these being usually in clusters of only 4 and each opening into a flat circular disk. These receptacles are also smaller, with more slender stipes and larger scales. There are no interstaminate bracts on the complemental inflorescences, while they are few or reduced to narrow, continuous lamellæ on the primary male receptacles. The styles are glabrous, and the pubescence on the twigs and leaves is longer, not so dense, and more erect.

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[a] Many of these achenia are abortive.

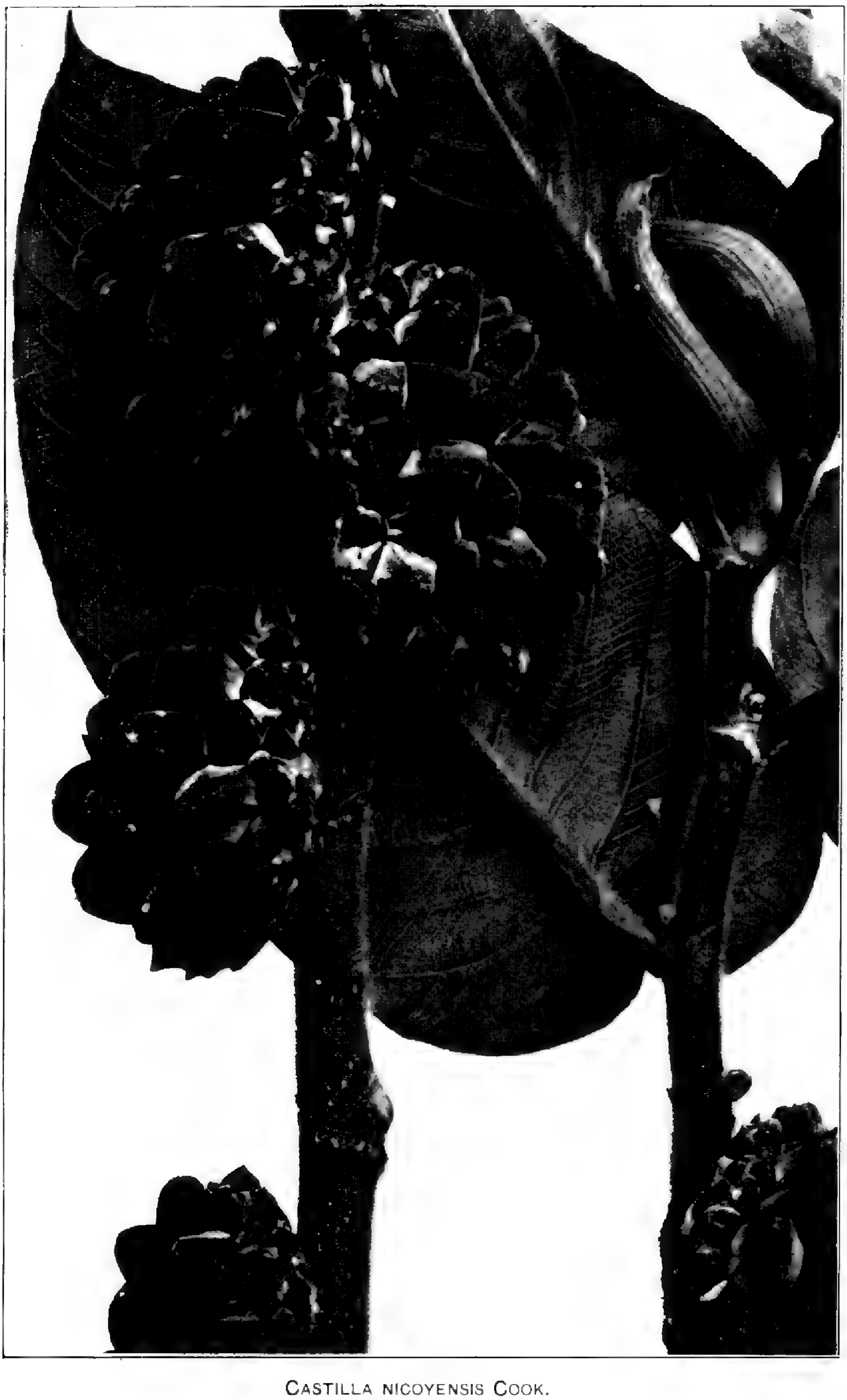
[b] Extreme dimensions of 10 seeds: Length, 8.04 and 10.60 mm.; diameter, 7.58 and 9.18 mm.



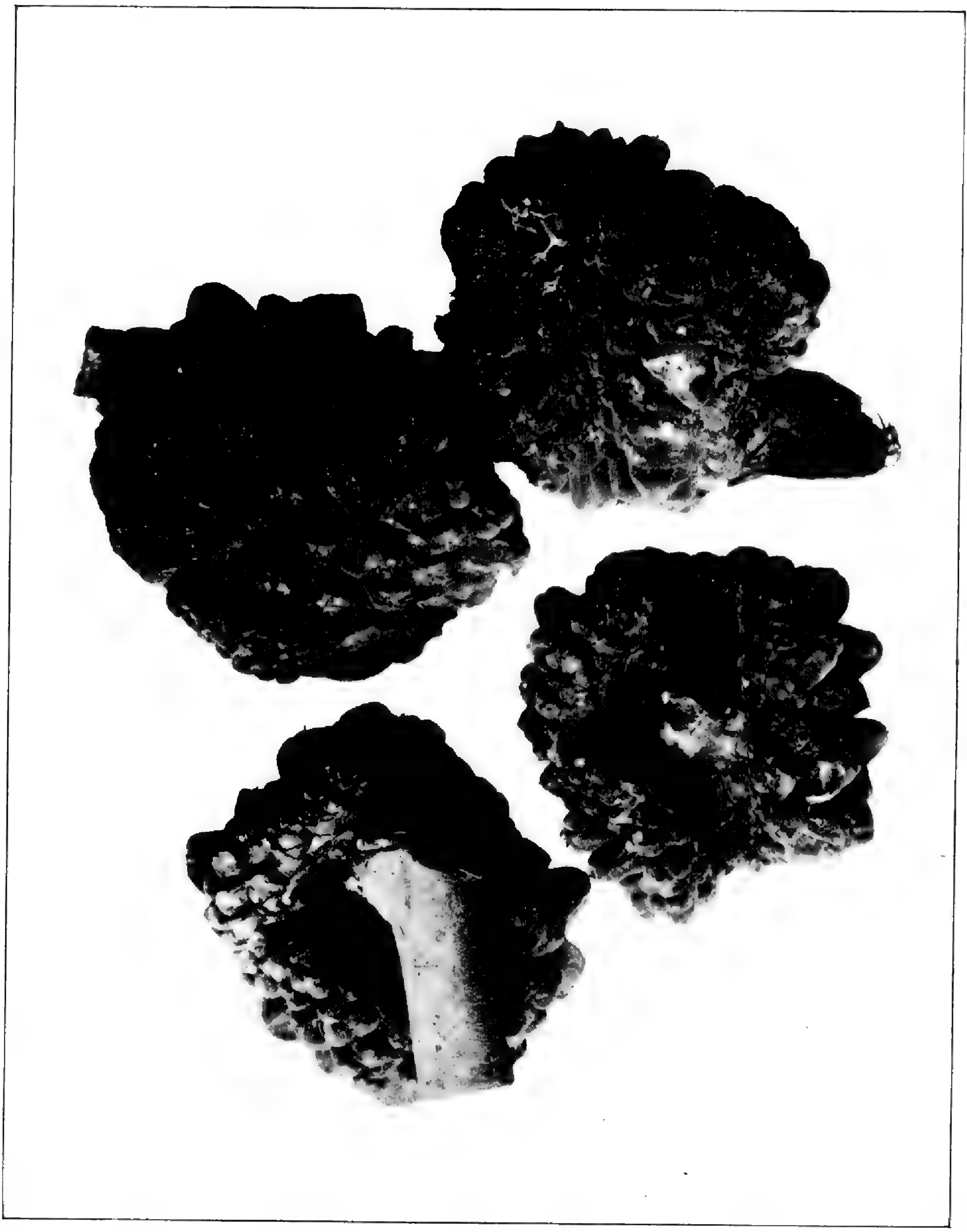

CASTILLA NICOYENSIS COOK.



CASTILLA NICOYENSIS COOK.



CASTILLA NICOYENSIS COOK.



CASTILLA ELASTICA CERVANTES.

So far *Castilla nicoyensis* is reported from the peninsula of Nicoya only, but the probability is that it will be found all along the coast of the Pacific, from Nicaragua to Panama. It is a good rubber producer, the milk being particularly abundant toward the end of the dry season, and to this fact is due its almost complete extermination in the western forests of Costa Rica. Besides being met with in widely isolated clumps in the forests of Nicoya, Guanacaste, Savegre, and the Diquís Valley, there are several small plantations of this species scattered in the first two districts and around Puntarenas and an extensive one in the "hacienda" of Dr. J. P. Valverde, near Las Cañas, on the southwestern slope of the volcano of Tenorio.

**10. Castilla elastica** Cervantes, Gac. Lit. Mex. Suppl. 1794.

PLATE 43. FIGURE 54.

A large tree, attaining 20 meters and over. Young twigs densely covered with yellowish or grayish hair.

Mature leaves rather large. Petioles 1 to 2 cm. long, thickly clad with grayish, brownish, or yellowish hair. Leaf blades 25 to 40 cm. long, 10 to 15 cm. broad, oblong-lanceolate or slightly lyrate, more or less deeply cordate at base, acuminate, rough, sparsely hairy and dark green above, velvety and paler beneath; midrib and primary veins (the latter alternate, 17 to 20 on each side of the first) little conspicuous and pubescent on the upper face of the leaf, prominent, neatly anastomosed and hairy beneath; margin obscurely sinuate, with tufts of hairs between the sinuses.[a] Stipules caducous, small (5 to 6 cm. long, 2 cm. broad), hairy outside, smooth and purplish inside.



FIG. 54.—Floral details of *Castilla elastica*. *a*, Cluster of stamens, primary inflorescence, 1 and 2 being abnormal forms; *b*, isolated stamens, one with bracteole; *c*, style with two stigmas; *d*, style with three stigmas. *a–d*, Scale 3.

Receptacles of the primary male inflorescence caducous, stipitate, 1 to 1.5 cm. long, 2 to 2.5 cm. broad, almost uniformly in clusters of 4 (bigeminate), covered outside with 6 or more imbricate rows of small (about 3.5 mm. long, 3 mm. broad), lanceolate, obtuse scales free at the tip; lobes flabellate, reflexed, and diversely plicate and distorted at time of anthesis. Stipes 1 to 1.5 cm. long, with a whorl of small, ovate-acuminate bracts at the base and a few more higher up. Interstaminate bracts numerous, shorter than the stamens. Stamens 2 to 3 mm. long, inserted sidewise, either singly or in clusters, along dichotomous, radial, foliaceous, diversely shaped crests; filaments flattened, 1.5 to 2.5 mm. long, often bearing a broad, ear-shaped bracteole; connective very large, scutellate; anther cells narrow.[b]

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[a] The leaves of seedlings and young trees (*Emrick* 20) are thinner, obovate and sharply acuminate. On immature leaves of adult trees the pubescence is thicker on both faces.

[b] The clusters of stamens are at the branching points of the crests, the isolated individuals scattered along the latter. The filaments are often adherent to the bracteoles for part of their length. Morphologically the bracts and the stamens seem to be equivalent; the filaments are flattened and membranous, like the crest itself. Toward the margin of the receptacle the crests and bracteoles disappear and the stamens issue directly from the floor of the receptacle. Often the filament is the direct outgrowth of a bracteole. On the bracteoles are sometimes seen anther cells adhering just in the same way as

Complemental male inflorescence not represented in the material; according to Cervantes's picture of the plant, receptacles clavate with an elongated stipe.

Receptacles of the pistillate inflorescence sessile or subsessile, covered outside with thick, gibbose, ovate-acuminate or lanceolate-acuminate scales, more or less free at the tips. Perianths adnate for their lower half, the free part velvety without and divided at the top into 3 or 4 lobules. Style very short (0.8 to 1.5 mm.), thick, sparsely hairy; stigmas 2, 3, or 5, broadly lanceolate, 3 to 4 mm. long, smooth or sparsely hairy outside and with a papillose, purple, stigmatic surface.

Fruiting receptacles large (4 cm. and more in diameter), distorted, partly reflexed, and often embracing the contiguous twig. Stipes nearly 1 cm. long or less, covered with velvety, thick, oblong-lanceolate bracts. Achenia 35 to 45 in each receptacle, their free upper half 1.5 to 2 cm. long, large, rounded, 3 to 4-grooved, fleshy and brick red when quite ripe, depressed at tip. Seeds more or less regularly ovoid, 9.6 to 10 mm. long, 6.2 to 6.8 mm .in diameter, "testa white and papery, cotyledons thick, plano-convex, radicle minute, superior (Hooker)."

MEXICO: Motzorongo, Veracruz, *Cook*, flowers and fruits, May, 1905 (U. S. National Herbarium nos. 615100–102; alcoholic materials); Coahuayula, Michoacan, *Emrick* 2, 20, only leaves, probably from young trees, the identification doubtful (Herbarium Field Museum nos. 95462 and 95480); scattered in the bottoms around Wartemberg, near Tantoyuca, Huasteca, Veracruz, *Ervendberg* 371, 1858, leaves and young fruits only, the identification doubtful (Gray Herbarium).

EXPLANATION OF PLATE 43.—Ripe fruits of *Castilla elastica*. From Motzorongo specimens. Natural size.

## EXCLUDED OR DOUBTFUL SPECIES.

These are here listed with references to the text and with a few additional notes. Poisson's *Castilla elastica liga*, not entered in the text, is also commented upon.


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| *Castilla markhamiana* Collins=*Perebea markhamiana* Benth | 249 |
| *Castilla tunu* Hemsl | 264–267 |
| *Castilla alba* Koschny | 251 |
| *Castilla nigra* Koschny | 251 |
| *Castilla rubra* Koschny | 251 |


*Castilla tunu* is discarded on account of its having been established on heterogeneous materials, belonging in part to *C. guatemalensis*, in part to *C. fallax*, and for the remainder to an insufficiently investigated species of British Honduras and the Eastern coast of Central America, known among the natives under the name of "tunú." Koschny's three species, which have never been described botanically, are mere variations due to environment. The difference is mainly in the bark and the specimens all show clearly the specific characters of *C. costaricana*.

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anthers do in full flowers on the petals, resulting from the reversion of the stamens.

The disposition of the bracteole on the filament may be peculiar to the Motzorongo form and *C. elastica*, as it has not been noticed in materials of Central or South American origin. In this case it would constitute a very good specific character.

The stamens of the Motzorongo specimens seem to be partially affected by some disease located in the anther cells, these looking sometimes abnormally swollen and enlarged, with black spots on the outside.

In 1901, Mr. J. Poisson, of the Paris Museum, published in an informal way his *Castilla elastica var. liga*[a], collected somewhere in Guatemala by Mr. René Guérin, Chief of the Chemical Laboratory of the government of that country. This variety is characterized mainly by the fact that it does not produce commercial rubber. Besides this, the leaves are said to be smaller, less hairy, and of a darker color than those of *Castilla elastica* (or rather of a species supposed to be that, since *C. elastica* has not yet been found in this part of Central America); the infructescences and seeds are also smaller, but the figured specimens are evidently immature ones.

The form referred to by Mr. Poisson may be identical with *Castilla tunu* Hemsley as to Honduran material, but this can not be decided on the fragmentary information at hand. At best, these data indicating the presence in Guatemala of a form that does not produce rubber might be accepted as a further testimony to the real existence of Hemsley's enigmatic species.

Mr. Poisson's suggestion that his *C. clastica var. liga* may be the primitive type of *C. clastica* Cervantes, this being an "ameliorated form" (?), is scarcely worth mentioning. Only modern man has reaped the benefit of such "natural selection" and times are long since past when the whole creation was considered as subservient to his needs.

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[a] Bull. Mus. Hist. Nat. Paris. 7:373-377. 1901.

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[Synonyms in italics. Pages of principal entries in heavy-faced type.]


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SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

# CONTRIBUTIONS

FROM THE

# UNITED STATES NATIONAL HERBARIUM

VOLUME 13, PART 8

## THE GENUS TALINUM IN MEXICO

By J. N. ROSE and PAUL C. STANDLEY

## TWO NEW SPECIES OF HARPERELLA

By J. N. ROSE

WASHINGTON
GOVERNMENT PRINTING OFFICE
1911

BULLETIN OF THE UNITED STATES NATIONAL MUSEUM

Issued February 24, 1911.

# PREFACE.

The first of the accompanying papers, by J. N. Rose and Paul C. Standley, deals with the Mexican species of Talinum, a genus of portulacaceous plants which has been much neglected in the past, only a few species having been known from Mexico. Studies of living plants in Washington and of accumulated herbarium material, however, have enabled the writers to revise all the proposed Mexican species of the genus and make numerous additions. Of the eighteen species here recognized, ten are new to science.

The second paper, by J. N. Rose, records two additional species of the recent umbelliferous genus Harperella.

FREDERICK V. COVILLE,
*Curator of the United States National Herbarium.*

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# THE GENUS TALINUM IN MEXICO.

By J. N. Rose and Paul C. Standley.

The genus Talinum, like other genera of the Portulacaceae and many groups of succulents, has been much neglected because of the difficulty of preparing good herbarium specimens of the plants. Dried material of this genus is usually unsatisfactory and permits one to form only an imperfect idea of the plants as they appear while growing. Commonly only the ends of branches are preserved, thus hiding their habit; and often the flowers, which furnish a means of distinguishing species, are so poorly pressed that even their color is lost. This is especially true of the flat-leaved Talinums. For this reason most students of the genus have grouped all its representatives under a few of the earlier published names.

During the last few years different collectors have sent to Washington living plants of various species of the genus. Many of these have thrived in the greenhouse and flowered at the proper season. With these living plants, and with additional herbarium material that has lately come to hand, we are able better to understand their peculiar characters and to use for diagnostic purposes some of these not readily perceptible in dried material and not before made out. As a result we have discovered a number of types that seem worthy of specific segregation.

The species of Talinum found in Mexico fall somewhat naturally into four groups. The first consists of those having terete leaves. All these are very much alike in habit, but differ in other and essential characters. Some have red, some yellow, and some white flowers. Of the flat-leaved plants the larger ones, those with their inflorescence in a compound panicle, like *T. paniculatum*, form a group composed of two species. Another group consists of plants of lower habit with inflorescence usually in the form of simple racemes, never a true panicle, typified by *T. triangulare*. Still another contains low plants with flat but very narrow leaves, like *T. lineare;* in these the inflorescence is axillary. This seems to be intermediate between the species having terete leaves and those with broad and flat ones, although more closely related, perhaps, to the latter. To be associated with the last group, but still so different as to appear almost anomalous, is a species lately described, *T. oligospermum*, with flat and narrow but very thick leaves.

The first species of Talinum described from Mexico was *T. lineare*, collected by Humboldt and Bonpland in central Mexico and described by Kunth in 1823. Six years later De Candolle published *T. napiforme*, also from central Mexico. It was not until 1879 that another species was described, Hemsley's *T. mexicanum*. Dr. Sereno Watson described two species from northern Mexico, *T. brevicaule* and *T. coahuilense*. The second of these seems not to be a true Talinum, but rather to belong in Talinaria, a genus recently published by Mr. T. S. Brandegee. *Talinum greenmanii* was described by Doctor Harshberger in 1897 in the Bulletin of the Torrey Botanical Club, along with notes and illustrations of certain other species. The last species to be published was Mr. Brandegee's *T. oligospermum* in 1906. We have seen material of all these and living plants of most of them.

*Calandrinia tuberosa* Benth., described from Hartweg's collections, was regarded by Bentham as closely related to *T. lineare*. It is said, however, to have obtuse leaves, and we have nothing that agrees with the description in this particular.

Judging from the differences exhibited by the specimens at hand it seems probable that when the flora of Mexico is better known several other species must be added to this list. More extended field observations of the plants disposed under *T. paniculatum* would probably reveal some constant differences among them.

KEY TO THE SPECIES.

Leaves terete.
- Inflorescence not surpassing the leaves.
  - Plants 4 cm. high or usually much higher; leaves not narrowed conspicuously toward the base.....1. *T. greenmanii.*
  - Plants 2.5 cm. high or less; leaves on long and very slender petioles.....2. *T. parvulum.*
- Inflorescence much surpassing the leaves.
  - Plants tall, 20 to 40 cm. high; flowers white, 15 mm. in diameter; leaves 8 to 10 cm. long.....3. *T. palmeri.*
  - Plants less than 20 cm. high; flowers yellow, pink, or purplish red (except in no. 6).
    - Sepals 7 mm. long or more; flowers proportionately large.....4. *T. brevicaule.*
    - Sepals 4 mm. long or less; flowers smaller.
      - Plants with poorly developed stems or acaulescent; peduncles appearing to spring from the root.
        - Flowers few; capsules green, very obtusely angled.....5. *T. napiforme.*
        - Flowers many; capsules purplish, acutely angled.....6. *T. multiflorum.*
      - Plants with well developed and branched stems, the peduncles arising along the branches.
        - Sepals obtuse; capsule subspherical.....7. *T. mexicanum.*
        - Sepals acuminate; capsule larger, oblong in section, pointed above.....8. *T. gracile.*

Leaves flat or flattish.
Leaves linear or linear-elliptical.
Leaves 7 mm. long or less, comparatively thick; petals 4 to 5 mm. long.....9. *T. oligospermum.*
Leaves 12 to 22 mm. long, thinner; petals 10 to 16 mm. long.
Flowers clustered at ends of the branches; sepals 9 or 10 mm. long.....10. *T. cymbosepalum.*
Flowers never clustered at the ends of the branches; sepals 5 or 6 mm. long.
Plants 15 cm. high or less; pedicels bracteate at or above the middle; leaves narrowly linear; stems branched only at the base..11. *T. lineare.*
Plants usually 40 to 50 cm. high; pedicels bracteate below the middle, usually near the base; leaves wider, linear to linear-elliptical; stems much branched.....12. *T. aurantiacum.*
Leaves oblanceolate, cuneate, obovate, or broadly elliptical.
Flowers axillary or in terminal simple racemes.
Flowers pink or red.
Sepals long-attenuate, not exceeding the capsule.....13. *T. attenuatum.*
Sepals oblong or ovate, acuminate, longer than the capsule.....14. *T. confusum.*
Flowers white.
Leaves comparatively large, obovate.....15. *T. triangulare.*
Leaves much smaller, oblanceolate or cuneiform.....16. *T. diffusum.*
Flowers in terminal panicles.
Flowers yellow; stems mostly reddish; leaves all except the uppermost obtuse, becoming gradually smaller above.....17. *T. chrysanthum.*
Flowers red; stems usually green; leaves acute, suddenly much reduced near the base of the inflorescence.....18. *T. paniculatum.*

**1. Talinum greenmanii** Harshberger, Bull. Torr. Club **24**: 183. 1897.

Type locality: "Volcanic gravel, Sierra de Ajusco, Mexico."

Six or 7 cm. high, from a thick, fleshy, tuberous root; stems only slightly developed, simple, numerous from each root; leaves numerous, crowded, terete, 4 to 5 cm. long; peduncles several from each stem, not exceeding the leaves, with 1 to 3 flowers; bracts early deciduous; petals yellow, 5; stamens 7 or 8; capsule pale green, ovoid or sectionally oblong, 6 mm. long, obtusely triquetrous.

*Specimens examined:*

FEDERAL DISTRICT: Sierra de Ajusco at 2,550 meters, August 31, 1896, *C. G. Pringle* 6472, type.

TEPIC: In the Sierra Madre near Santa Teresa, August 12, 1897, *J. N. Rose* 2221.

CHIHUAHUA: In the Sierra Madre, June 12 to July 29, 1899, *E. W. Nelson* 6094; near Colonia García, Sierra Madre, July 19, 1899, altitude 2,400 meters, *Townsend & Barber* 151.

**2. Talinum parvulum** sp. nov.

Cespitose from a thick, tuberous root, acaulescent, 2.5 cm. high or less; leaves terete, about 1 cm. long, on slender petioles as long or longer; inflorescence cymose, with 2 to 4 flowers on each peduncle, not exceeding the leaves; petals yellow, about 3 mm.

long; sepals rather obtuse, soon deciduous; capsule 3 mm. long, obtusely triquetrous; seeds very small, smooth.

It might be possible to confuse this with *T. greenmanii*, but it is a much smaller plant, acaulescent, and with different leaves, and the seeds are not half as large as in that species.

Type U. S. National Herbarium no. 571476, collected at Otinapa, Durango, July 25 to August 5, 1906, *Dr. Edward Palmer* 451.

**3. Talinum palmeri** sp. nov. PLATE 44.

Perennial from a stout, thickened root, acaulescent, 40 cm. high or less; leaves terete, acutish, 8 or 9 cm. long or less, scarcely attenuate toward their bases; flowers numerous, 15 mm. in diameter; petals white, 8 or 10 mm. long; sepals obtuse, almost orbicular, 3 mm. long; stamens 5; capsule about 5 mm. long, oblong in section and triquetrous; seeds grayish, rugulose.

Its large white flowers distinguish this plant from all the related species, and the size of the plant is greater than in other members of this group.

Type U. S. National Herbarium no. 571462, collected at Otinapa, Durango, July 25 to August 5, 1906, *Dr. Edward Palmer* 436. The species has been grown in the greenhouse in Washington from plants sent by Doctor Palmer at the time he collected the type specimens.

This species is dedicated to Dr. Edward Palmer, who has collected the type material of three of the new species proposed, as well as many of the other specimens cited. Besides the type, he collected the same plant in the vicinity of Durango between April and November of 1896 (no. 303).

EXPLANATION OF PLATE 44.—From a specimen grown at Washington, sent from Tepehuanes, Durango, by Dr. Edward Palmer in 1906.

**4. Talinum brevicaule** S. Wats. Proc. Amer. Acad. **21:** 446. 1886.

Type locality, "In the Santa Eulalia Mountains, Chihuahua."

A low perennial, 8 cm. high or less, from a large, thick, woody root; stems stout and woody, poorly developed and little branched; leaves terete, rather stout, 12 mm. long or less, acutish; peduncles slender, only slightly longer than the leaves, each bearing 1 to 3 flowers, these on pedicels 8 mm. long; sepals lanceolate, acute, 7 mm. long; petals purplish red, 12 mm. long; capsule not seen.

*Specimens examined:*

CHIHUAHUA: Santa Eulalia Mountains, May 20, 1885, *C. G. Pringle* 26 (Gray Herbarium, type).

Through the kindness of Dr. B. L. Robinson we have been permitted to examine the type. It consists of a single plant, perhaps the only one collected, for there is no material of this collection in the National Herbarium. *Talinum brevicaule* has larger flowers than any of the terete-leaved members of the genus.

**5. Talinum napiforme** DC. Prodr. **3:** 357. 1828.

*Claytonia tuberosa* Moç. & Sesse in DC. Prodr. loc. cit.

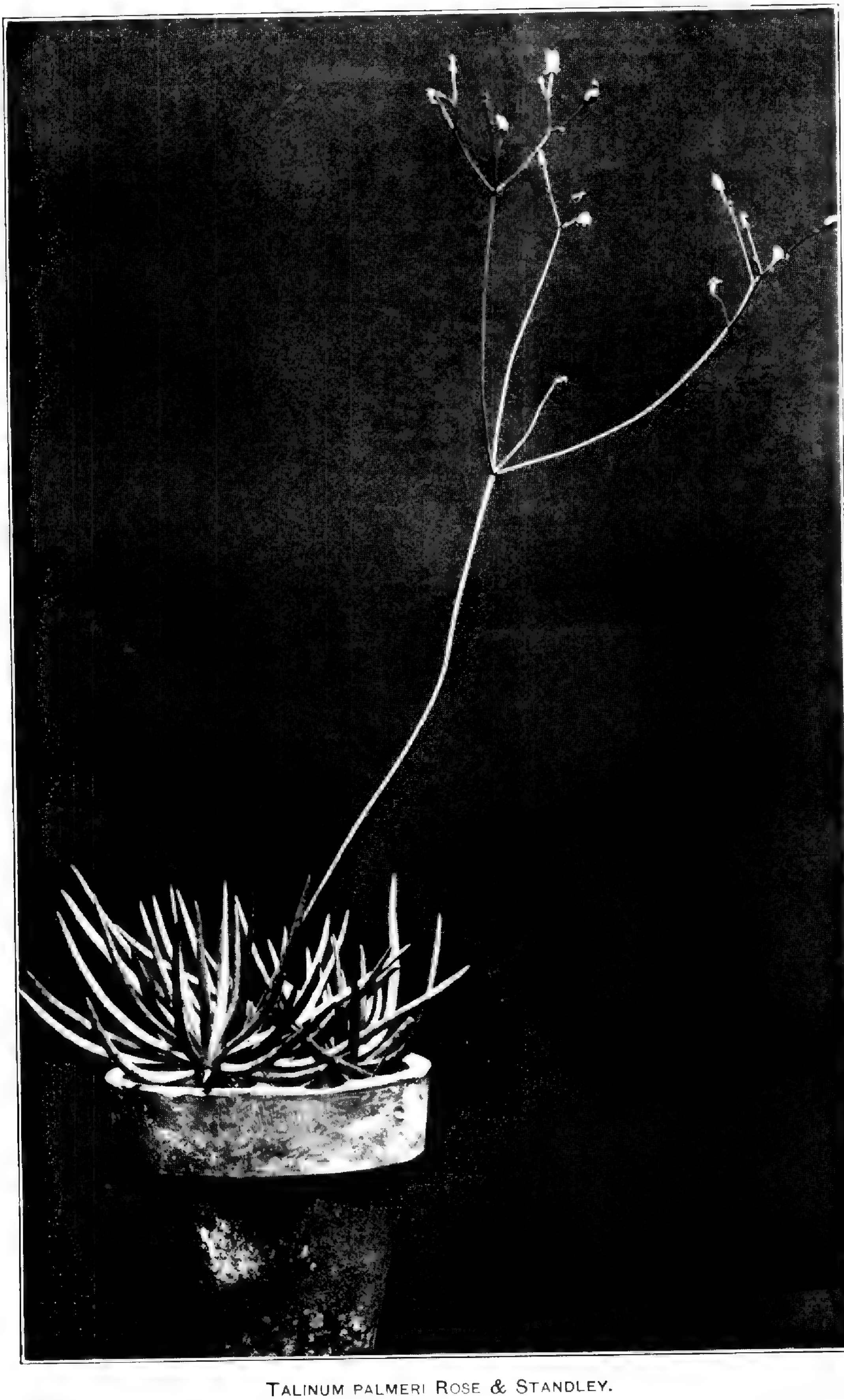
Type locality, "In Mexico."

Eight to 15 cm. high from a thick, tuberous root, almost acaulescent, the stems being poorly developed, several of them from each root; leaves terete, 4 to 8 cm. long, rather stout, erect; peduncles numerous, slender, cymosely much branched above, flowers numerous, on pedicels 7 to 15 mm. long, with white petals about 7 mm. long; sepals broadly ovate, acutish, 4 mm. long; capsules 5 mm. high, pointed at the apex, obtusely triquetrous.

*Specimens examined:*

FEDERAL DISTRICT: Tlalpam, Valley of Mexico, August 20, 1896, *J. W. Harshberger* 166.

The specific name, referring to the shape of the root, is very appropriate, but would apply equally well to several other members of the genus.



TALINUM PALMERI ROSE & STANDLEY.

**6. Talinum multiflorum** sp. nov.

Ten centimeters high or less, from a tuberous root; leaves terete, 3.5 cm. long or less, rather slender, all basal; peduncles several, spreading, not strictly erect, abundantly cymosely branched above; sepals oblong or ovate, obtuse, 2.5 mm. long; flowers numerous, 12 mm. in diameter when fully spread, the oblanceolate, acutish petals reflexed; capsule 4 mm. long, sharply 3-angled, purplish.

This is a smaller and more slender plant than *T. napiforme*, to which it is perhaps most closely related. Its leaves are smaller, its flowers more numerous, and its capsules purplish and much more acutely angled.

Type U. S. National Herbarium no. 571460, collected at Otinapa, Durango, July 25 to August 5, 1906, *Dr. Edward Palmer* 434. Collected again by Doctor Palmer at Tejamen, Durango, August 2–7, 1906 (no. 538). Living plants sent to Washington by the same collector from Tepehuanes, Durango, have flowered several times.

**7. Talinum mexicanum** Hemsl. Diag. Pl. Nov. **2:** 23. 1879.

Type locality, "Mexico, in regione San Luis Potosi."

Five to 7 cm. high; stems slender, much branched and well developed; leaves terete, 5 to 8 mm. long, slender, acute, clustered at the summit of the stem; peduncles several from each stem, very slender, cymosely branched above, each bearing 3 to 8 very small flowers; petals 3 mm. long or less; sepals about one-half as long as the petals, almost orbicular, broadly obtuse; capsule 3 mm. long, subspherical, light green.

*Specimens examined:*

SAN LUIS POTOSÍ: San Luis Potosí, at 1,800 to 2,400 meters, 1878, *Parry & Palmer* 69.

**8. Talinum gracile** sp. nov.

Perennial from a thick, woody, much branched root; stems well developed, slender, much branched, 14 cm. high or less; leaves terete, numerous, scattered along the branches, 3 cm. long or less; flowers few, cymose, on pedicels 1 to 2 mm. long, these subtended by awl-shaped bracts; sepals ovate to lanceolate, with acuminate, spreading tips; capsule ovoid, 3 or 4 mm. long, obtusely triquetrous; seeds smooth.

Type U. S. National Herbarium no. 129772, collected in "thin soil of granitic ledges; La Bufa Mt. above Cusihuiriachic," Chihuahua, August 31, 1887, *C. G. Pringle* 1197. This collection was distributed as *T. parviflorum*, from which the plant appears abundantly distinct in its well developed, much branched, and more slender stems, in its numerous scattered leaves and acute sepals with spreading tips, and in not having its leaves widened but rather narrowed at their bases.

*Other specimens examined:*

CHIHUAHUA: Cañon de San Diego, September 17, 1891, *C. V. Hartman* 771.

**9. Talinum oligospermum** Brandegee, Zoe **5:** 245. 1906.

Type locality, "On Cerro de la Yerba, Puebla, growing in dry, rocky soil."

A low perennial, 6 to 8 cm. high, from a subspherical tuberous root; stems numerous, much branched, slender, whitish; leaves linear-oblong, flat, obtuse, 7 mm. long or less, scattered along the stems; peduncles numerous, one or more to each branch of the stem, cymosely branched above and bearing several flowers; sepals broadly oblong or ovate, obtuse, purplish, 2.5 mm. long or less; petals bright yellow, 4 or 5 mm. long; capsule 3 mm. long; rather obtusely triquetrous, purplish.

*Specimens examined:*

PUEBLA: Cerro de la Yerba, June, 1908, *C. A. Purpus* 2513 (type collection).

In our key we have placed this species near *T. lineare*, a treatment that may be somewhat confusing, for the plant is not very closely related to that species, suggesting rather *T. gracile*. Its leaves, although flat, are very different from those of *T. lineare*, being much thicker and narrower.

**10. Talinum cymbosepalum** sp. nov.

A low perennial, 15 cm. high or less, from a thick, tuberous root; stems branched near the base, otherwise simple, stout, fleshy; leaves broadly linear, acute, flat, 15 to 40 mm. long; flowers axillary but all crowded at the ends of the stems, on very stout and thick pedicels, these 5 to 12 mm. long, flattish, bracteate at or below the middle or ebracteate; sepals ovate, acuminate, strongly concave, 9 or 10 mm. long, conspicuously nerved; petals about 16 mm. long, apparently reddish; capsule 8 mm. long, ovoid.

Type U. S. National Herbarium no. 840776, collected at Los Naranjos, Oaxaca, May, 1908, *C. A. Purpus* 3091. This collection was distributed as *T. lineare*, but the plants have much larger flowers, apparently of a different color, and broader leaves, and have the flowers clustered at the ends of the branches. *Talinum cymbosepalum* is from a locality far to the south of the area in which *T. lineare* is known to occur.

**11. Talinum lineare** H. B. K. Nov. Gen. & Sp. **6:** 77. 1823.

Type locality, "Locis aridis, inter Mexico et Real de Pachuca, prope Gasave, in valle Tenochtitlanensi, alt. 1230 hex.", in the State of Hidalgo.

A low perennial, usually less than 15 cm. high, from a thick, fleshy root, branched from the base but the branches simple, stout, and fleshy; leaves 12 to 22 mm. long, linear, thick and fleshy, acute, narrowed at the base; peduncles solitary in the axils of the leaves, bearing one or two flowers, these on pedicels 1 cm. long; pedicels bracteate at or above the middle; petals bright yellow, about 1 cm. long; sepals 5 or 6 mm. long, unequal, ovate, acute or one of the two sometimes obtuse; capsules 6 mm. long, subspherical, obtusely triquetrous; seeds subspherical, black, rugulose.

*Specimens examined:*

HIDALGO: Near Tula, 1905, *Rose, Painter & Rose* 8298.

FEDERAL DISTRICT: Near Guadalupe, Valley of Mexico, 1903, *Rose & Painter* 8057; near Tlalnepantla, 1905, *Rose, Painter & Rose* 8425; Cerro de Guadalupe, August 18, 1896, *J. W. Harshberger* 106.

**12. Talinum aurantiacum** Engelm. Bost. Journ. Nat. Hist. **6:** 153. 1850.

Type locality, "On the Sabinas and more abundantly on the Llano, rare about New Braunfels, on rocky soil or almost naked rocks," Texas; type collected by Lindheimer.

Fifteen to 50 cm. high, from a fleshy root, branched from the base, the branches usually again much branched, erect, stout; leaves flat, linear or linear-elliptical, acute, narrowed at the base, 15 to 45 mm. long; inflorescence axillary, the peduncles usually simple and 1-flowered, bracteate near the base or at least below the middle, 13 to 20 mm. long, slender, somewhat thickened toward the base of the flower, reflexed in fruit; sepals about 6 mm. long, ovate, acuminate, conspicuously nerved; capsule 7 mm. long, subspherical, obscurely triquetrous; seeds black, rugulose.

By some *T. aurantiacum* has been considered the same as *T. lineare*, but it can be distinguished from that species by its larger size, branched stems, usually broader leaves, and differently bracteate pedicels. This species is common in the southwestern United States, while *T. lineare* is not found outside of Mexico.

*Specimens examined:*

CHIHUAHUA: Santa Eulalia Plains, August 18, 1885, *Wilkinson;* near Lake Santa Maria, 1899, *E. W. Nelson* 6402.

SAN LUIS POTOSÍ: Region of San Luis Potosí, 1878, *Parry & Palmer* 68.

**13. Talinum attenuatum** sp. nov.

A low, somewhat suffrutescent, branched perennial; leaves oblanceolate, obtuse, not retuse, mucronate, cuneate at the base; flowers few, in terminal simple racemes, each pedicel subtended by a linear, attenuate bract 4 mm. long; sepals lanceolate, long-



TALINUM DIFFUSUM ROSE & STANDLEY.

attenuate, about 8 mm. long; petals pink, 9 or 10 mm. long; stamens about 20; pedicels about 1 cm. long, thick and fleshy, narrowly clavate.

The pink flowers of this plant might lead one to place it with *T. crassicaule* if it were not for its very narrow sepals and low stature. It has narrower sepals than any other member of this group.

Type U. S. National Herbarium no. 300431, collected at Rosario, Sinaloa, July 10, 1897, *J. N. Rose* 1585.

**14. Talinum confusum** sp. nov.

An erect perennial, branched from near the base, with thick, fleshy roots; stems stout, somewhat suffrutescent below; leaves broadly oblanceolate, retuse, cuneate at the base, about 5 cm. long; inflorescence racemose; pedicels clavate, about 1 cm. long; sepals 8 mm. long, ovate or oblong, with long-acuminate tips; petals pink; capsule shorter than the sepals, subspherical, obtusely triquetrous; bracts of the inflorescence 3 or 4 mm. long, linear.

The specimens included here have been distributed as *T. triangulare*, *T. crassicaule*, and *T. racemosum*, but they seem to be different from all those species. Ours is a lower plant with longer sepals than *T. crassicaule*, and it differs from *T. triangulare* in its pink flowers and narrower leaves.

Type U. S. National Herbarium no. 316680, collected in Tomellin Cañon, Oaxaca, July 6, 1897, *C. G. Pringle* 6738; altitude about 900 meters.

*Other specimens examined:*

OAXACA: Between La Venta and Niltepec, altitude 60 meters, July 14, 1895, *E. W. Nelson* 2799; about Logunes, altitude 255 meters, June 5, 1895, *Nelson* 2642.

**15. Talinum triangulare** Willd. Sp. Pl. **2:** 862. 1799.

Type locality, "In America ad maris littora."

Tall, usually almost one meter high; stems thick and fleshy, rather abundantly branched; leaves obovate, 4 to 9 cm. long, rounded at the apex and sometimes obscurely emarginate, narrowed at the base; inflorescence consisting of a few short, branched, axillary peduncles; flowers on pedicels 1 cm. long; sepals 5 mm. long, broadly lanceolate, acuminate; petals white, 12 mm. long; capsule subspherical, surpassing the sepals; seeds black, finely papillate.

One Mexican specimen, collected in Yucatan by *G. F. Gaumer* (no. 733) seems to belong here. The species appears to be not uncommon in the West Indies and in South America.

**16. Talinum diffusum** sp. nov. PLATE 45.

Perennial, about 15 cm. high, diffusely branched; stems stout and fleshy, becoming almost woody below; leaves oblanceolate-cuneiform, retuse and mucronate, very thick and fleshy, dark green; flowers in terminal simple or rarely branched racemes, their pedicels subtended by minute lanceolate bracts, the pedicels 1 cm. long or less, obtusely triangular and clavate; of the two sepals one oblong and emarginate with a stout mucro between the apical lobes, the other ovate or lanceolate and acuminate; petals white; flowers about 18 mm. in diameter; petals ovate, acute, or acuminate; stamens about 20; capsule obscurely triquetrous; seed very dark brown or black.

Type U. S. National Herbarium no. 572643, collected at Victoria, Tamaulipas, in 1907, *Dr. Edward Palmer* 415. Living plants sent to Washington, flowered during May and June of 1909. A photograph of one of these is reproduced here. The low diffuse habit of the plant, the short stout stems, narrow and small leaves, and peculiar sepals separate it from the other members of the group.

EXPLANATION OF PLATE 45.—From a specimen grown at Washington, sent from Victoria, Tamaulipas, in 1907, by Dr. Edward Palmer.

**17. Talinum chrysanthum** sp. nov.

Perennial from a thick, rather fleshy root; stems stout, one meter high or less, reddish, little branched or simple; leaves numerous, thick and fleshy, obovate to oblanceolate, 10 cm. long or less, rounded at the apex, attenuate to the base; inflorescence an elongated and much branched panicle; flowers on pedicels 15 mm. long; petals bright yellow; sepals very unequal, almost orbicular; capsule obtusely triquetrous, reddish; seeds black and shining, minutely papillose.

Type U. S. National Herbarium no. 301854, collected at Bolaños, Jalisco, September 10–19, 1897, *J. N. Rose* 2907.

It is possible that this is *T. reflexum* Cav., but that species was described from the West Indies and is illustrated as having acute, mostly opposite leaves. In our plant the leaves are all alternate and obtuse. The plant described here has long been confused with *T. paniculatum*, largely because herbarium specimens do not show the differences that exist between the two species. We have had the two growing side by side in the greenhouse where they seem very different. The new species has yellow flowers, red stems, and obtuse leaves which extend well up into the inflorescence, becoming gradually smaller above; while *T. paniculatum* has red flowers and green stem, and has most of its leaves about the lower part of the stem with only a few much reduced ones above. In the latter species, also, most of the leaves are acute.

The following specimens seem to belong here as well: Durango and vicinity, 1896, *Dr. E. Palmer* 607; Yautepec, Morelos, August 27, 1903, *Rose & Painter* 6563; Cuernavaca, Morelos, September 10, 1903, *Rose & Painter* 6936; Aguascalientes, August 20, 1903, *Rose & Hay* 329.

**18. Talinum paniculatum** (Jacq.) Gaertn. Fruct. & Sem. **2:** 219. 1791.

*Portulaca paniculata* Jacq. Enum. Pl. Carib. 22. 1762.

*Portulaca patens* L. Mant. Pl. 242. 1771.

*Ruelingia patens* Ehrh. Beitr. Naturk. **3:** 135. 1788.

*Talinum patens* Willd. Sp. Pl. **2:** 863. 1799.

Type locality not given, but doubtless in the West Indies.

A tall perennial, 30 to 100 cm. high; stems stout, green, fleshy, simple, or branched near the base; leaves oblanceolate to obovate or elliptical, 5 to 10 cm. long, acute, thick and fleshy, becoming suddenly very small at the base of the inflorescence, narrowed at the base into a short petiole or sessile; inflorescence a loose panicle, this with many short, slender, mostly dichotomous, divergent branches; flowers on slender pedicels 5 to 10 mm. long; sepals reddish, almost orbicular, strongly concave; petals rose red; capsule subspherical, green, obscurely triquetrous; seeds black, minutely papillose.

The original description of this plant reads simply "*Portulaca floribus panniculatis,*" but since we have seen only the one West Indian species to which this description is applicable this name is probably used properly here and should be preferred to the later *T. patens*. The latter name has been much more commonly used than has *T. paniculatum*.

*Specimens examined:*

JALISCO: Guadalajara, September 28–29, 1903, *Rose & Painter* 878.

SINALOA: Near Rosario, on the road to Acaponeta, July 27, 1897, *Rose* 1853.

FEDERAL DISTRICT: Near Tlalpam, Valley of Mexico, June 30, 1905, *Rose, Painter & Rose* 8248.

QUERÉTARO: Loma de Querétaro, August 20, 1905, *F. Altamirano* 1612.

COAHUILA: Saltillo, June, 1898, *Palmer* 271.

SAN LUIS POTOSÍ: Region of San Luis Potosí, *Parry & Palmer* 71.

CHIHUAHUA: Near Seven Star Mine, Sierra Madre, altitude 2,100 meters, *Townsend & Barber* 394.

# TWO NEW SPECIES OF HARPERELLA.

By J. N. Rose.

In 1902 Dr. Roland M. Harper discovered in Georgia a new genus belonging to the Umbelliferae, which I afterwards named in his honor.[a] In 1905 Doctor Harper collected a similar umbellifer in the mountains of Alabama, which we then both considered to be the same plant, *Harperella nodosa*, although the type had come from a very different region, that of the Coastal Plain. A reexamination of this material shows that it is specifically distinct from that species and it is here described as new.

In 1907 Dr. Forrest Shreve collected a strange umbellifer near Hancock, Md., which I was unable to name. It appeared clearly new to our flora, but without fruit its generic position could not easily be determined. Doctor Harper suggested that it might be *Harperella nodosa*, and urged me to have it collected again. In the meantime Doctor Harper found a specimen in the Torrey Herbarium, collected by Doctor Aiken some seventy-five years before, near Harper's Ferry, W. Va., which he considered to be the same as Doctor Shreve's plant.

On October 5, 1910, I visited Hancock for the purpose of collecting this strange plant. I took with me a detailed description of the region visited by Doctor Shreve, with which I easily located the very spot from which he had obtained his specimens. The station is about 2 miles above Hancock and perhaps a half mile below Round Top Mountain, and not very far below the narrows formed by that mountain and the hills on the south side of the Potomac River. Doctor Shreve's instruction was to follow up the tow path along the Chesapeake and Ohio Canal to a point where a small stream with an arroyo-like bed leads from the canal to the river. This little stream ends in a sandy delta and here on the edge of this delta and just above the high-water mark of the Potomac grew this plant. It is in a small springy swamp filled chiefly with Juncus and Cyperus, and unless it were in flower it would almost surely be overlooked, and even then it might easily be passed over. Although it was October, many plants were

[a] **Harperia** Rose, Proc. Nat. Mus. **29:** 441. 1905, not Fitzgerald, 1904.
**Harperella** Rose, Proc. Biol. Soc. Washington **19:** 96. 1906.

still in bloom, so that both flowers and fruits were collected. A careful examination of this material shows that it is abundantly distinct from *Harperella nodosa*. It is much nearer the species from Alabama, but surely specifically distinct, and hence it is described as new.

**Harperella vivipara** Rose, sp. nov.

Stem annual (?), slender and weak, at first erect, afterwards somewhat spreading, 10 to 30 cm. long, usually simple or sometimes with one or two branches, in age throwing out bulblets from the axils of all the leaves; basal leaves 2 or 3, 4 to 8 mm. long, terete, jointed, bright green, glabrous, hollow, with a scarious stipular sheath at base; stem leaves similar but shorter, alternate, shorter than the internodes; inflorescence consisting of a terminal umbel, with or without a second axillary one; peduncle 1 to 4 cm. long; rays 3 to 10 mm. long; involucre, if present, consisting of a single small bract; bractlets of the involucels 4, minute; flowers white; stylopodium conical; fruit 1.25 mm. long, broader than long.

Type U. S. National Herbarium no. 640627, collected by J. N. Rose near Hancock, Md., October 5, 1910.

*Specimens examined:*

MARYLAND: Near Hancock, on the banks of the Potomac River, July, 1905, *Forrest Shreve;* same locality, October 5, 1910, *J. N. Rose.*

**Harperella fluviatilis** Rose, sp. nov.

Stems said to be biennial, from a dense cluster of yellow roots, with an umbelliferous odor, erect, 20 to 25 cm. high, more or less bulbiferous; leaves nodose, "evergreen," terete, 10 to 15 cm. long; inflorescence of 1 to 3 umbels; rays 8 mm. long; involucre and involucel bractlets several, minute; flowers white, fruit oblong, 1.5 mm. long.

Type U. S. National Herbarium no. 51421, collected on Town Creek, Sand Mountains, near Chavres, De Kalb County, November 24, 1905, *R. M. Harper* 8.

*Specimens examined:*

ALABAMA: Rocky bed of Town Creek, type collection; rocky bed of Little River, on Lookout Mountain, De Kalb County, November 25, 1905, *R. M. Harper.*

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# CONTRIBUTIONS

FROM THE

# UNITED STATES NATIONAL HERBARIUM

VOLUME 13, PART 9

## STUDIES OF MEXICAN AND CENTRAL AMERICAN PLANTS—No. 7

By J. N. ROSE




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# PREFACE.

The accompanying paper, by Dr. J. N. Rose, is a continuation of his Studies of Mexican and Central American Plants. It contains a brief account of his seventh journey to Mexico. Most of the plants discussed are new or recently described species which Doctor Rose discovered in the field or while studying various groups of Mexican plants. Some twenty-four new species of Crassulaceae are here described. This is a remarkable addition to our knowledge of this group, for the family had been extensively studied during several years prior to 1905, when the North American species were monographed. Some of the present new species are of horticultural interest. *Echeveria crenulata*, *E. holwayi*, and *E. gloriosa* are somewhat similar to the well-known *E. metallica* of our greenhouses. To Urbinia, a recent segregate from Echeveria, two more species are added. One of these, *Urbinia purpusii*, is a curious plant suggesting in habit and foliage the south African genus Haworthia. The plant is worthy of a place in every good succulent collection. In cultivation it has shown no tendency to produce suckers and perhaps its propagation can be accomplished only by seed.

FREDERICK V. COVILLE,
*Curator of the United States National Herbarium.*

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# STUDIES OF MEXICAN AND CENTRAL AMERICAN PLANTS—NO. 7.[a]

By J. N. Rose.

## INTRODUCTORY NOTES.

The present number of these studies is confined almost entirely to Mexican plants. The rich collections of E. W. Nelson and E. A. Goldman, C. G. Pringle, E. Palmer, C. A. Purpus, and C. Conzatti have, as in previous reports, furnished most of the new species. In addition to these my own collections, now comprising some 10,000 numbers, have been drawn upon. These come from all parts of Mexico, my visits having now been extended to all but four of the twenty-nine States and Territories of that country.

In 1908 I made my seventh journey to Mexico. Primarily this was not a Mexican expedition, but rather one into the southwestern United States. I had been invited by Dr. D. T. MacDougal, director of the Desert Laboratory, to make a special study of the Cactaceae about Tucson, Arizona, and upon his recommendation a grant from the Carnegie Institution was made to enable me to visit the Southwest, making collections in western Texas, New Mexico, Arizona, and southern California. While thus engaged I entered Mexico at three points. At two of these, Nogales, Sonora, and Initial Monument, Lower California, only a short time was spent in collecting plants. Opposite El Paso more time was given to this work.

On March 30, accompanied by Dr. E. Palmer, the veteran botanical collector, I left El Paso over the Mexican Central Railroad for Chihuahua City, some 250 miles south of the United States border, and the following day I took train for Miñaca, located some 250 miles west of Chihuahua City. Here I made a small collection, obtaining two interesting cacti, *Opuntia tenuispina* and *Echinocactus polyacanthus*, along with various herbs and shrubs. The next day I returned east from Miñaca as far as San Antonio, where I took a stage for Cusihuiriachic. From San Antonio the road runs almost directly south over a grassy mesa until within a few miles of the latter place, when it rapidly descends into a deep and narrow ravine. Nearly all

[a] Continued from vol. 12, p. 302, of the Contributions.

the houses face the single street, which is several miles long. The elevation of the town is a little over 1,800 meters, but the mountains come down to its edge, and one of the near-by peaks, called the Bufa, rises to an elevation of nearly 2,400 meters. At the time of my visit the town was in a deplorable condition of decay, hundreds of people having departed to other localities.

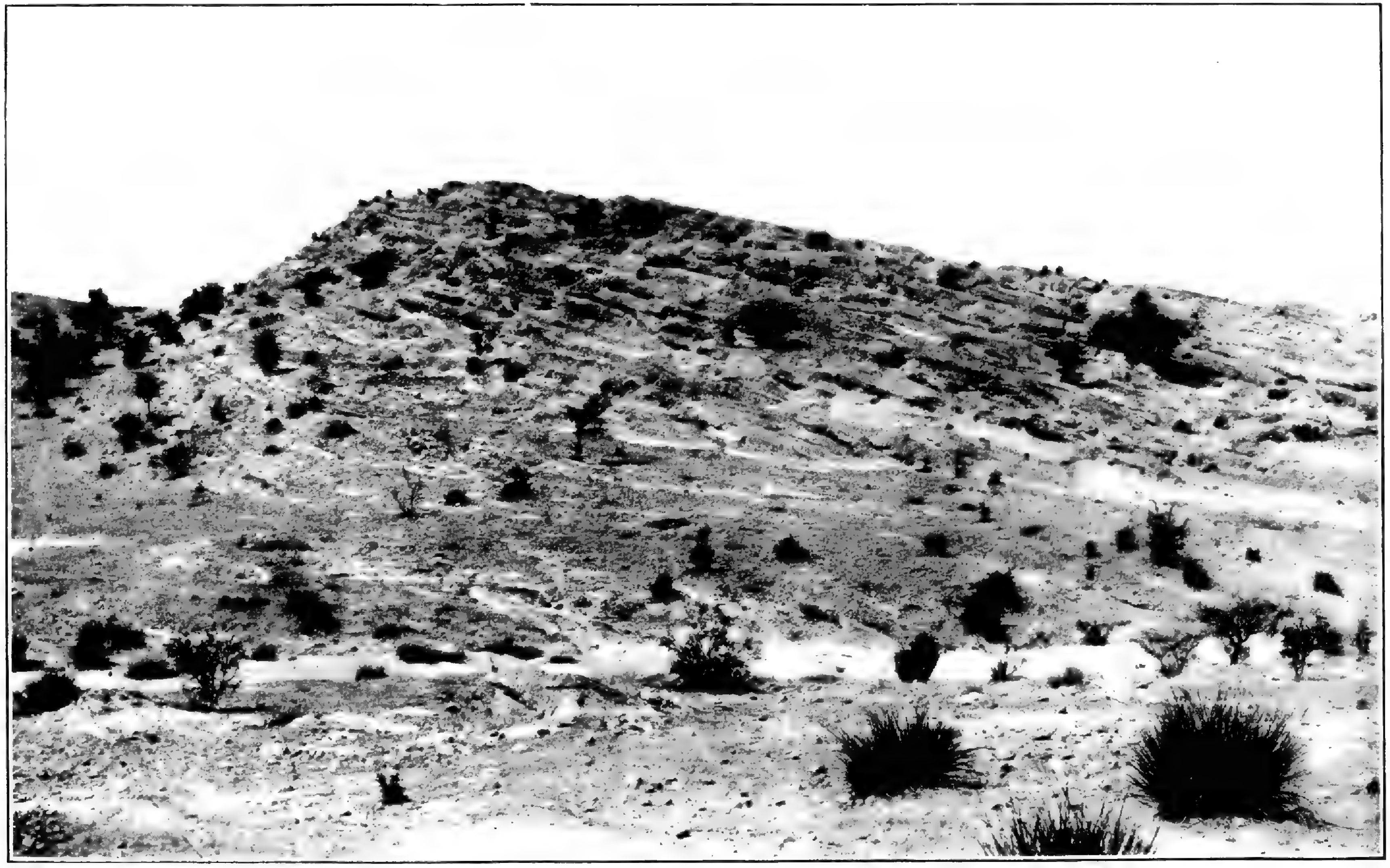
I had long been anxious to visit that locality, as it was the place where Dr. A. Wislizenus was held a prisoner during the Mexican war and where he collected many new species. I went especially to re-collect his Cactaceae, of which Dr. George Engelmann had described six species. The cactus flora was very scant, but all the species were collected, although in most cases only a single specimen was found. The forest vegetation has doubtless changed very much since Wislizenus's time, for the pines, of which he found three new species, have nearly all disappeared and the mountains are nearly treeless. Along the stream which runs through the town are still some large poplars.

On April 4, accompanied by Dr. E. Palmer, I took the train at Chihuahua City and proceeded up into the Santa Eulalia Mountains, some 10 miles east of Chihuahua City. In these mountains considerable silver ore is mined, and at the time of our visit work was being actively prosecuted. Only one day was spent here, but many interesting Cactaceae were examined, some of which proved to be undescribed. A few weeks later Doctor Palmer returned to Santa Eulalia and made an extensive collection. In 1888 these mountains were widely explored by Dr. C. G. Pringle, who brought out of them many new species.

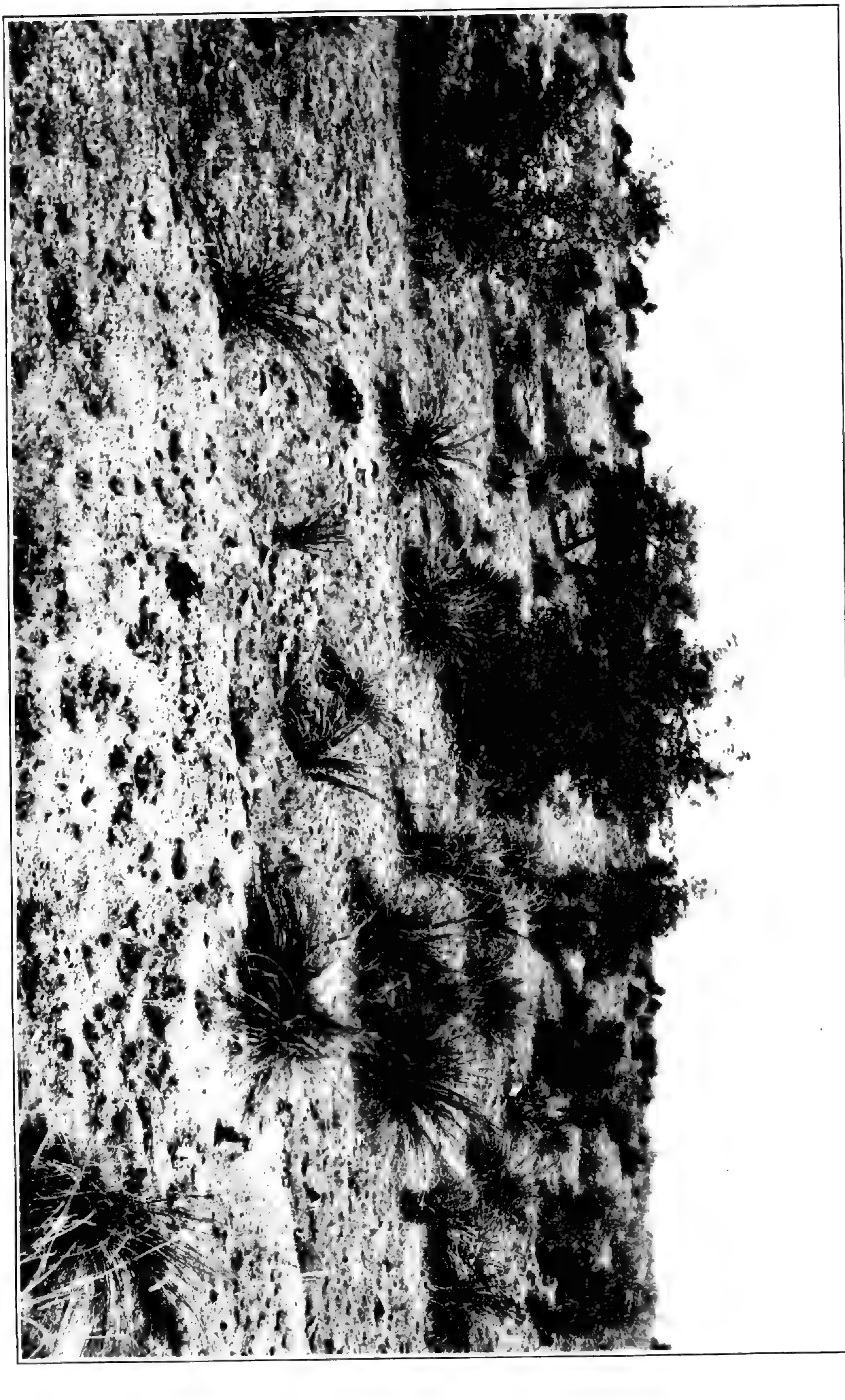
Several days were spent at El Paso and Juarez. Several excursions were made into the Franklin Mountains and a day was given to exploring the low hills in Chihuahua southwest of El Paso. On this day I had the assistance of Prof. Elmer Stearns and his botanical students, some thirty in all, of the Agricultural College at Juarez. These Mexican boys were greatly interested in my work and brought in many cactus specimens. In 1907 I had made a previous visit to El Paso and during these two short trips some forty numbers were collected.

These places were especially interesting as being the type localities of many of the species collected by some of the older explorers. Of these species were obtained *Echinocereus stramineus* Engelm. and *Populus wislizeni* Sargent.

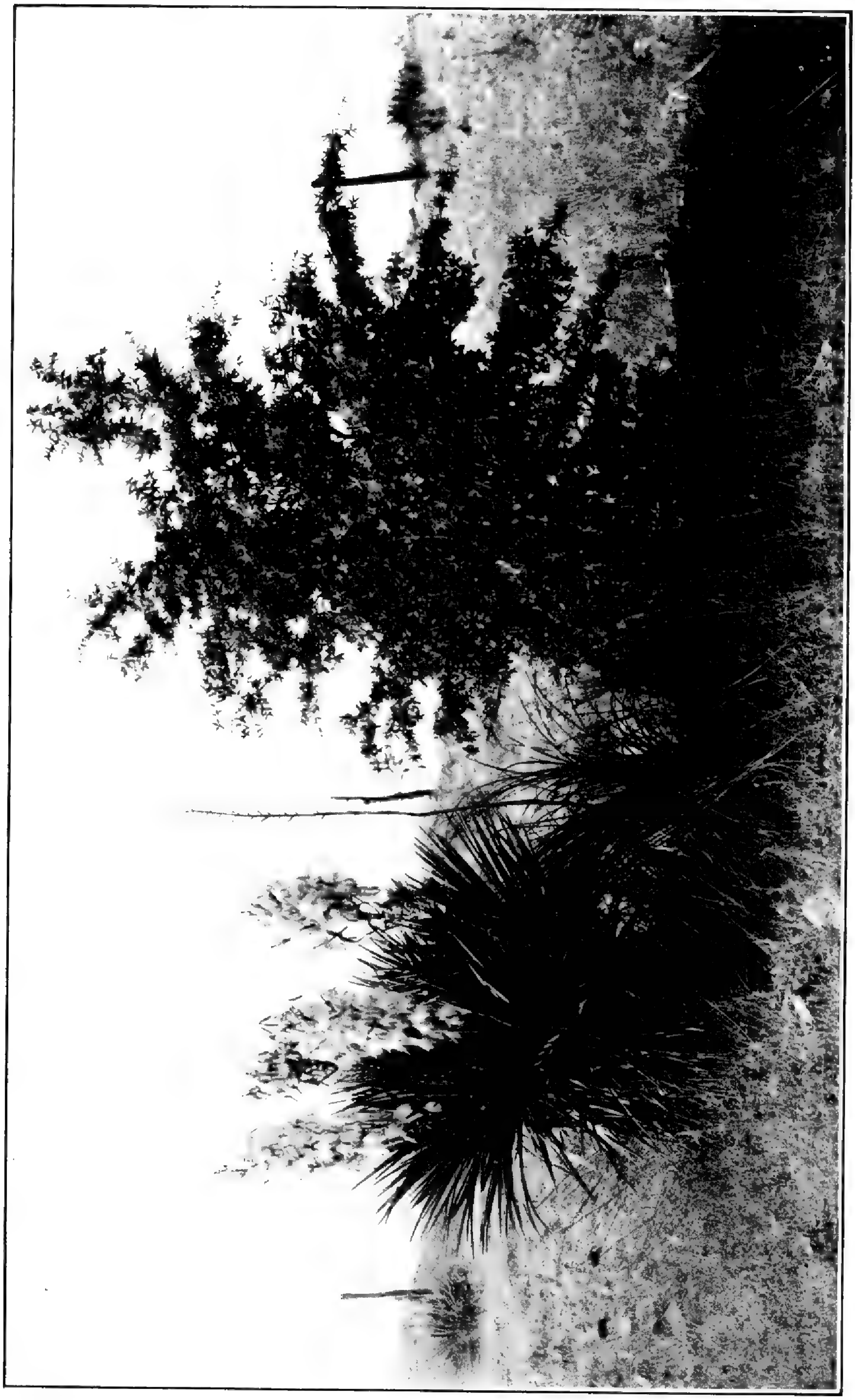
On the morning of April 29 Doctor MacDougal took me in an automobile from Tucson to Nogales on the international boundary. The next day we collected various Cactaceae and some other plants, and also obtained some fine photographs both of the landscape and of individual plants. (Plates 46, 47.)



VIEW AT NOGALES, SHOWING SCANTY VEGETATION.



VIEW AT NOGALES, SHOWING BEAR GRASS (NOLINA) AND SCRUB OAKS.



YUCCA BREVIFOLIA AND AN OAK AT NOGALES.



COWANIA STANSBURIANA, A CHARACTERISTIC DESERT SHRUB AT NOGALES.

The hills about Nogales are low with rounded summits and bear a very scanty desert vegetation. Seven species of Cactaceae belonging to the genera Mamillaria, Opuntia, and Echinocactus were collected. The rare *Yucca brevifolia* Engelm., was collected in full flower (pl. 48). This was taken not far from the type locality of the species, which was first collected by A. Schott some time in the fifties. Only leaves were obtained by Schott and flowers have never been collected until now. These are borne in large, erect, compact panicles, are white and hanging, and instead of being small as they were supposed to be, are very large. *Linum puberulum* (Engelm.) Heller, was common, while a curious Rhus, perhaps *Toxicodendron phaseoloides* Greene, grew attached to the perpendicular side of a cliff. A Nolina was common, but was not in flower or fruit and no specimens were taken. *Cowania stansburiana*, a characteristic shrub was in full flower and herbarium specimens and a photograph were secured (pl. 49). *Calochortus kennedyi* was not uncommon.

On May 16, accompanied by Mr. C. R. Orcutt, I drove from San Diego to Initial Monument on the boundary line between Lower California and the State of California. As Mr. Orcutt is very familiar with all this region it was an unusual privilege to have him point out the many interesting plants, not a few of which have their type localities at this station. Among the Cactaceae which were of interest to me were *Bergerocactus emoryi*, *Echinocactus limetus*, *Opuntia serpentina*, *O. prolifera*, and *Mamillaria dioica*.

### ITINERARY.

| 1908. | | |
|---|---|---|
| March | 29, 30 | Juarez and vicinity, Chihuahua. |
| April | 1, 2 | Miñaca, Chihuahua. |
| | 2, 3 | Cusihuiriachic, Chihuahua. |
| | 3, 4 | Chihuahua City, Chihuahua. |
| | 4 | Santa Eulalia Mountains, Chihuahua. |
| | 5–9 | Juarez and vicinity, Chihuahua. |
| | 29, 30 | Nogales and vicinity, Sonora. |
| May | 14 | Initial Monument, International Boundary, Lower California. |

## COMMELINACEAE.

### SETCREASEA AN OLDER NAME THAN NEOTRELEASEA.

A new genus Treleasea was established by the writer in 1899, but in 1903 he changed the name to Neotreleasea on account of an earlier genus Treleasea of fungi which had been overlooked. In the meantime, however, Schumann and Sydow had renamed it Setcreasea.[a]

Since my publication of this genus as Treleasea I have repeatedly studied it in the herbarium and greenhouse and in the field in Mexico. The generic characteristics assigned to it are perfectly satisfactory.

[a] Setcreasea Schum. & Sydow, Just's Bot. Jahresb. 27[1] :452. 1901.

One of the results of this continued study is the addition of two new species which are here described. These are accompanied by the names of the species heretofore described.

**Setcreasea australis** Rose, sp. nov.

Stems from a cluster of tuberous roots, 50 to 60 cm. high, glabrous; leaves lanceolate, 15 to 20 cm. long, perhaps even longer, acuminate, glabrous above, softly pubescent beneath, the margin purplish and ciliate, clasping at base; flowers numerous, in both axillary and terminal clusters; corolla pinkish; stamens borne on the petals; anthers short and broad, the connective rather narrow; ovary glabrous.

Type U. S. National Herbarium no. 454128, collected by J. N. Rose in Tomellín Cañon, Oaxaca, Mexico, September 7, 1906 (no. 11340).

**Setcreasea brevifolia** (Torr.).

*Tradescantia leiandra brevifolia* Torr. Bot. Mex. Bound. 225. 1859.
*Tradescantia speciosa* Buckl. Proc. Acad. Phila. **1862:** 9. 1863, not L. nor H. B. K.
*Zebrina* (?) *leiandra* Clark in DC. Monogr. Phan. **3:** 318. 1881.
*Tradescantia leiandra* Wats. Proc. Amer. Acad. **18:** 167. 1883, not Torr.
*Tradescantia leiandra ovata* Coulter, Contr. Nat. Herb. **1:** 50. 1890.
*Tradescantia* (?) *brevifolia* Rose, Contr. Nat. Herb. **3:** 323. *pl. 16*. 1895.
*Treleasea brevifolia* Rose, Contr. Nat. Herb. **5:** 207. 1899.
*Neotreleasea brevifolia* Rose, Contr. Nat. Herb. **8:** 6. 1903.

**Setcreasea leiandra** (Lindley).

*Tradescantia leiandra* Torr. Bot. Mex. Bound. 224. 1859.
*Treleasea leiandra* Rose, Contr. Nat. Herb. **5:** 208. 1899.
*Neotreleasea leiandra* Rose, Contr. Nat. Herb. **8:** 7. 1903.

**Setcreasea pallida** Rose, sp. nov.

Stems at first erect but soon clambering, 20 to 40 cm. long, glabrous and green; internodes rather short; leaves oblong, 8 to 10 cm. long, trough-shaped above, pale and somewhat glaucous on both surfaces, glabrous except for some cobwebby hairs along the margin, clasping at base; involucral leaves 2 or 3, similar to the leaves but shorter; umbel sessile, several-flowered; sepals 3, scarious; corolla purplish white, funnel-shaped.

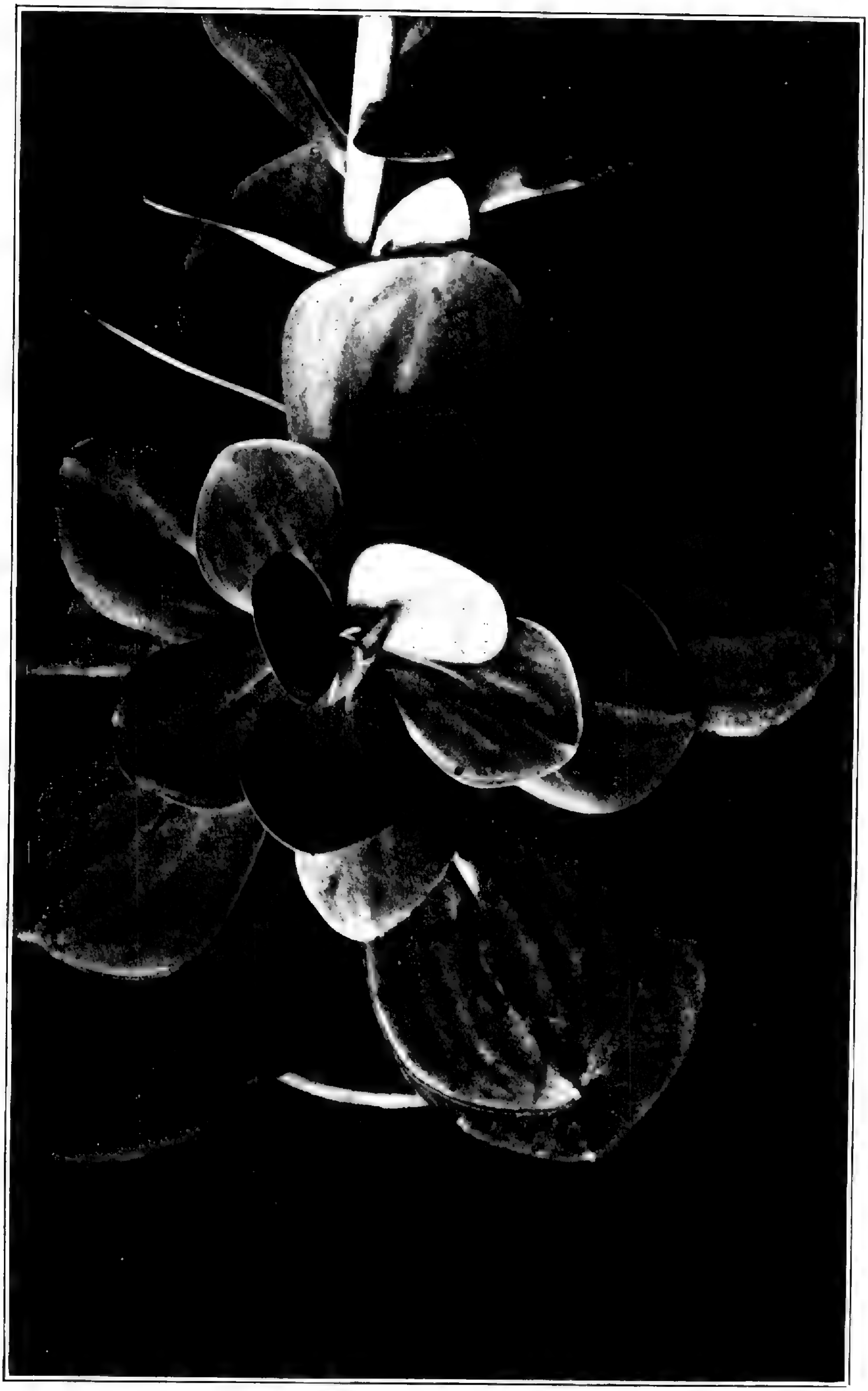
Type U. S. National Herbarium no. 572818, collected by Dr. E. Palmer near Victoria, Tamaulipas, Mexico, 1907, and flowered in Washington, D. C., July, 1907.

**Setcreasea tumida** (Lindl.).

*Tradescantia tumida* Lindl. Bot. Reg. **26:** *pl. 42*. 1840.
*Tradescantia virginiana tumida* Clark in DC. Monogr. Phan. **3:** 291. 1881.
*Treleasea tumida* Rose, Contr. Nat. Herb. **5:** 208. 1899.
*Neotreleasea tumida* Rose, Contr. Nat. Herb. **8:** 7. 1903.

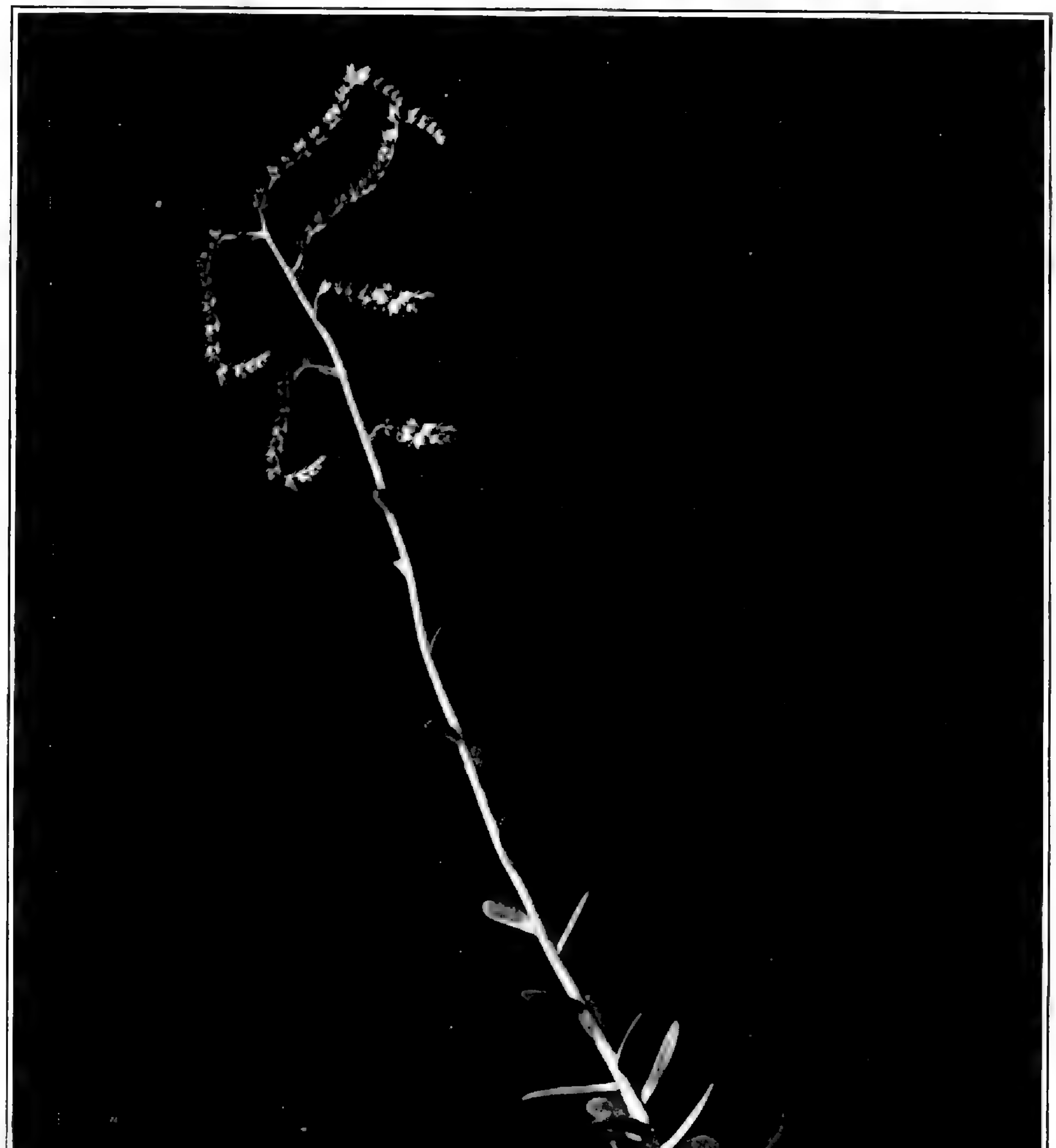
## CRASSULACEAE.

Since the publication of the Crassulaceae by Britton & Rose in the North American Flora in 1905, collectors in Mexico have continued to send material to Washington. Not all of it has yet flowered, but many specimens have done so, a considerable number of which are new. Herewith are presented the descriptions of 15 new species of Sedum, 1 species of Urbinia, 3 species of Echeveria, and 2 species of Tilleastrum, and of 1 new genus, Graptopetalon. So far as possible photographs are taken when the plants are in flower and in every



ECHEVERIA GLORIOSA ROSE.

(Scale one-half.)



ECHEVERIA GLORIOSA ROSE.

case herbarium specimens are preserved in the National Herbarium. In most cases living material can be supplied to Botanical Gardens or persons who have growing collections. Two species, *Sedum potosinum* and *S. farinosum*, are offered for sale by Haage & Schmidt. The plates are all from photographs of living material taken in Washington.

## FOUR NEW SPECIES OF ECHEVERIA AND ONE NEW NAME.

**Echeveria crenulata** Rose, sp. nov.

Caulescent, the stem in cultivated specimens short but in wild specimens much elongated and enlarged; basal leaves in the wild plant broadly obovate, more than 30 cm. long, 15 cm. broad, rounded at apex, tapering at base into a very distinct petiole; stem leaves pale green, a little glaucous, the margin wavy and purplish red; leaves on flowering stems acute, ovate to spatulate, tapering into a stout, thick petiole; inflorescence a short panicle, the lateral branches short, few-flowered, the bract instead of subtending the branch usually carried up for some distance on the peduncle; sepals widely spreading, very unequal, acute; corolla 15 mm. long, strongly angled, yellowish red, its lobes acute.

Type U. S. National Herbarium no. 454957, collected by J. N. Rose and J. H. Painter near Cuernavaca, Morelos, Mexico, September, 1903 (no. 797). No. 790 of Rose and Painter is the same. The species has flowered repeatedly in Washington and New York.

**Echeveria gloriosa** Rose, sp. nov. PLATES 50, 51.

Stems about 30 cm. tall, crowned with a compact cluster of highly colored leaves, from which arise several erect or spreading flowering stems sometimes a meter long; leaves 10 to 15 cm. long, 7 to 10 cm. broad, rounded at apex, deep purple, thickish; flowering stem stout, glaucous; stem leaves narrow, thickish, very glaucous; inflorescence an open panicle; lateral branches bearing numerous sessile flowers; sepals ascending; corolla 12 mm. long, dark red, in bud broadly ovate, but when fully open showing a wide mouth.

Type U. S. National Herbarium no. 615398, derived from a specimen collected on rocks of Cerro de Santa Lucia, Puebla, altitude 1,500 to 1,800 meters, 1907 by C. A. Purpus (no. 423), which flowered in Washington in 1909 and 1910.

**Echeveria holwayi** Rose, sp. nov.

Caulescent, in cultivated specimens the stem short and stout; leaves forming a dense rosette at top of stem, pale green, slightly glaucous, sometimes purplish, obovate, obtuse, mucronate, narrowed at base into a stout, short petiole, the margin somewhat wavy, 10 to 12 cm. long; flowering stem 90 to 120 cm. long, often deep red and glaucous, its leaves scattered; inflorescence a much-branched panicle; main branches axillary, 5 to 15-flowered; flowers arranged in a secund raceme; pedicels short, often only 1 or 2 mm. long; sepals erect or ascending, linear, acute, very unequal; corolla 12 mm. long, rose-colored when fully open, its lobes acute, with spreading tips.

Type U. S. National Herbarium no. 399680, collected by E. W. D. Holway near Oaxaca, Mexico, November, 1903, and flowered in Washington, December, 1905, and November, 1909 (Rose's no. 693). This species flowered in Washington at the side of *E. gigantea*. It is of similar stature to this, but has much lighter and differently margined leaves, redder stems, longer flowering branches, and different flowers.

**Echeveria microcalyx** Britt. & Rose.

*Echeveria purpusi* Britton, N. Amer. Flora **22:** 26. 1905, not Schum. 1896.

This species was again collected in 1907 and flowered in Washington in 1909 and 1910.

**Echeveria pittieri** Rose, sp. nov.

Caulescent, 10 cm. or more high, crowned at the apex by a loose rosette of leaves, glabrous throughout; leaves 6 to 8 cm. long, oblanceolate, tapering into a distinct petiole, acute, greenish or somewhat purplish, sometimes a little glaucous; flowering stem about 20 cm. long, leafy; leaves similar to stem leaves; inflorescence a dense spike 4 to 5 cm. long; flowers subtended by small linear rose-colored bracts and two inner bractlets; calyx cleft nearly to the base into linear, acute lobes about two-thirds the length of the corolla, rose-colored; corolla when in bud somewhat 5-angled; corolla about 12 mm. long, deeply cleft, the lobes stiff, erect or slightly spreading, acute, rose-colored, with a pronounced pocket near the base within; 5 stamens opposite the 5 petals inserted just above this pocket, the other 5 attached to the corolla but lower down; ovaries erect, tipped by the long, slender styles.

Type U. S. National Herbarium no. 618381, collected around the lagoon on the volcano of Ipala, Guatemala, altitude, 1,500 meters, by Henry Pittier (no. 1880).

The living material sent by Mr. Pittier flowered in Washington in January, 1911.

## GRAPTOPETALUM, A NEW GENUS.

**Graptopetalum** Rose, gen. nov.

Acaulescent or in time becoming shortly caulescent; leaves forming a rather compact rosette, thickish, acute; inflorescence a few-flowered, open cyme; sepals 5, erect, green, nearly distinct; corolla short-tubular, its lobes widely spreading horizontally or even reflexed, more or less banded with red; stamens 10, in age recurved back of the petals; carpels 5, erect even when mature, abruptly contracted into a short style; scales small.

The rosettes of this plant suggest a small Echeveria, while the flowers and inflorescence point to Sedum. The rotate corolla is very unlike a true Echeveria, while the united petals would keep it out of Sedum. The flower is somewhat like that of Altamiranoa, but its habit, foliage, etc., do not agree well with that genus.

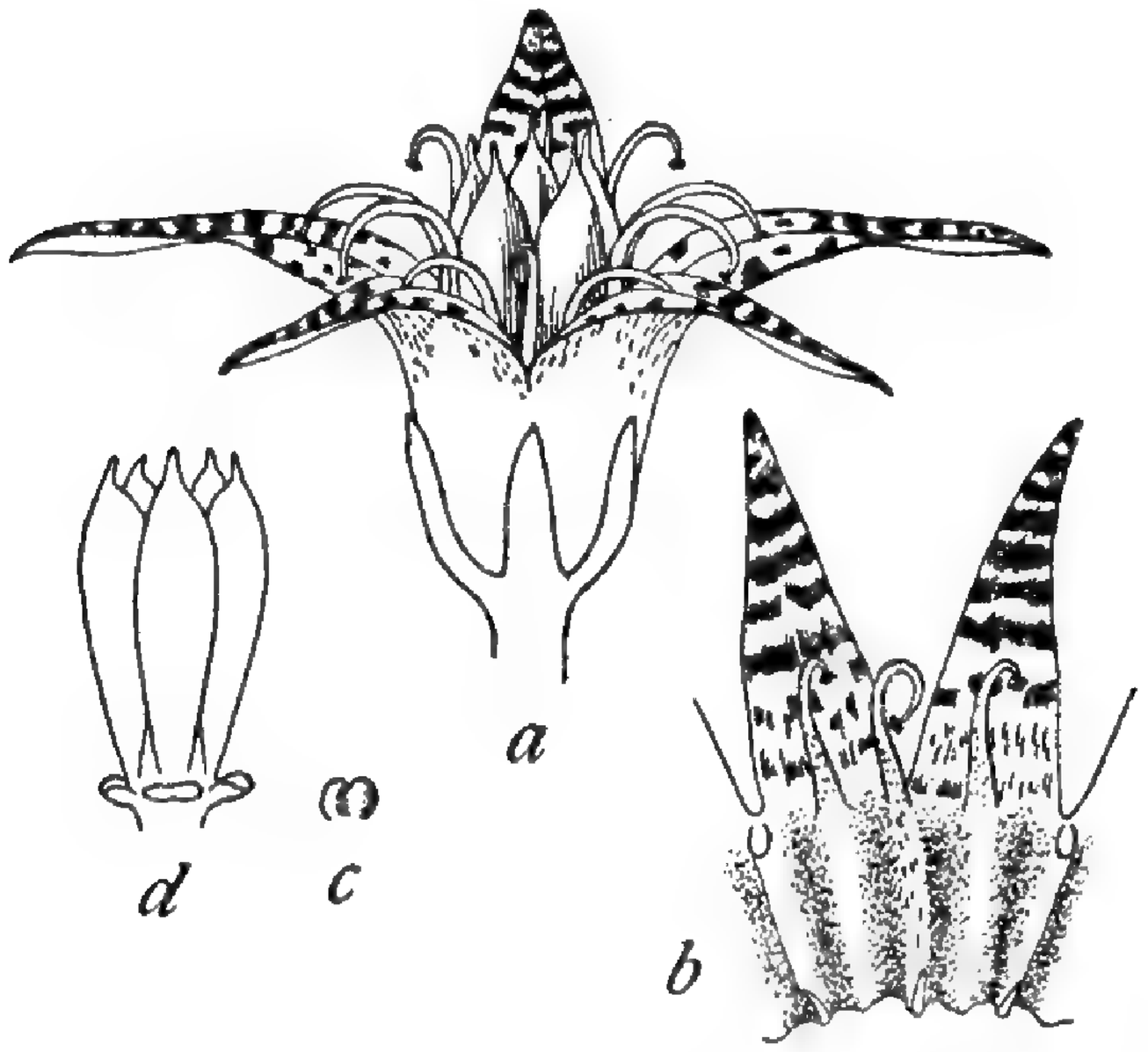


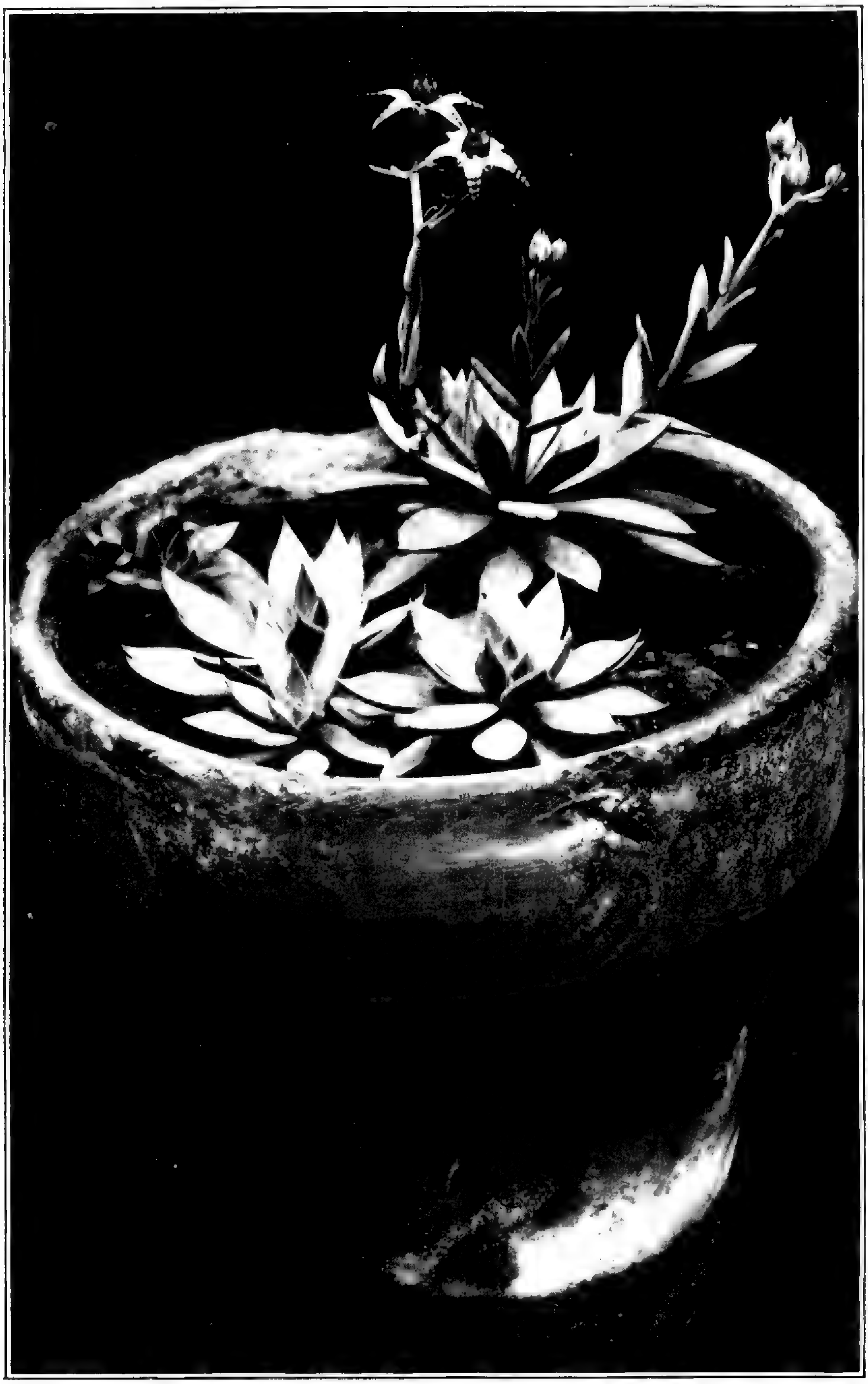

FIG. 55.—*Graptopetalum pusillum*. *a*, Flower; *b*, petals and stamens; *c*, scale at base of carpel; *d*, carpels. Natural size.

The name alludes to the markings of the petals.

**Graptopetalum pusillum** Rose, sp. nov. PLATE 52. FIGURE 55.

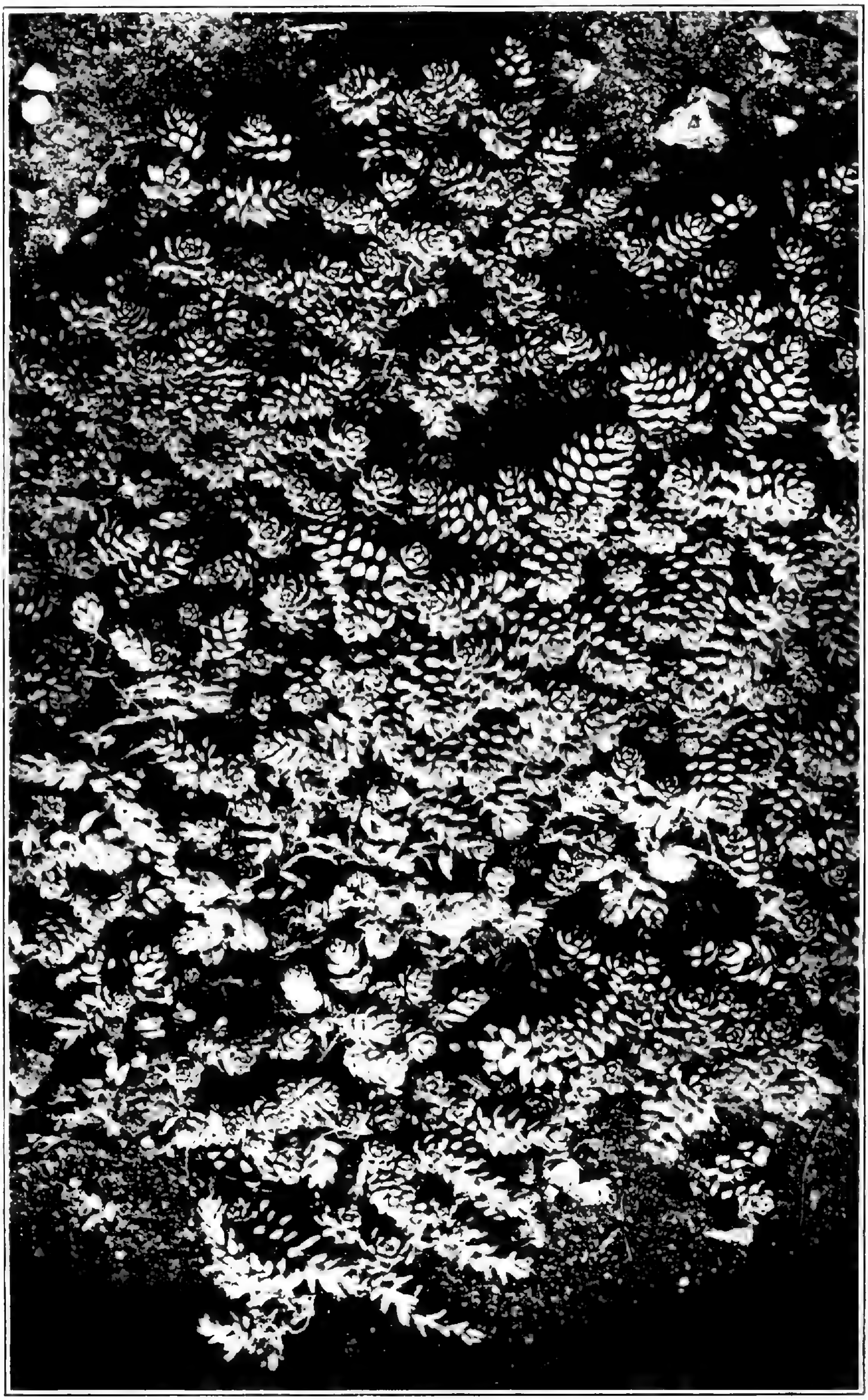
Rosettes 3 to 4 cm. in diameter; leaves spatulate, 2 to 4 cm. long, acute, glabrous, pale, and slightly glaucous; stems about 10 cm. long, weak but erect or often falling over; stem leaves alternate, linear; inflorescence somewhat cymose; pedicels 4 to 8 mm. long; sepals linear, acute, distinct nearly or quite to the base, 2 to 3 mm. long, slightly glaucous; corolla tube 2 to 3 mm. long; lobes 6 to 7 mm. long, spreading or recurved, acute, yellowish to cream-colored, slightly blotched or banded with red; stamens slender, in age recurved upon the tube of the corolla; carpels erect at least when young.

Type U. S. National Herbarium no. 615399, derived from material collected by Dr. E. Palmer in the State of Durango, Mexico, in 1906, and flowered in Washington in 1906 and 1907.



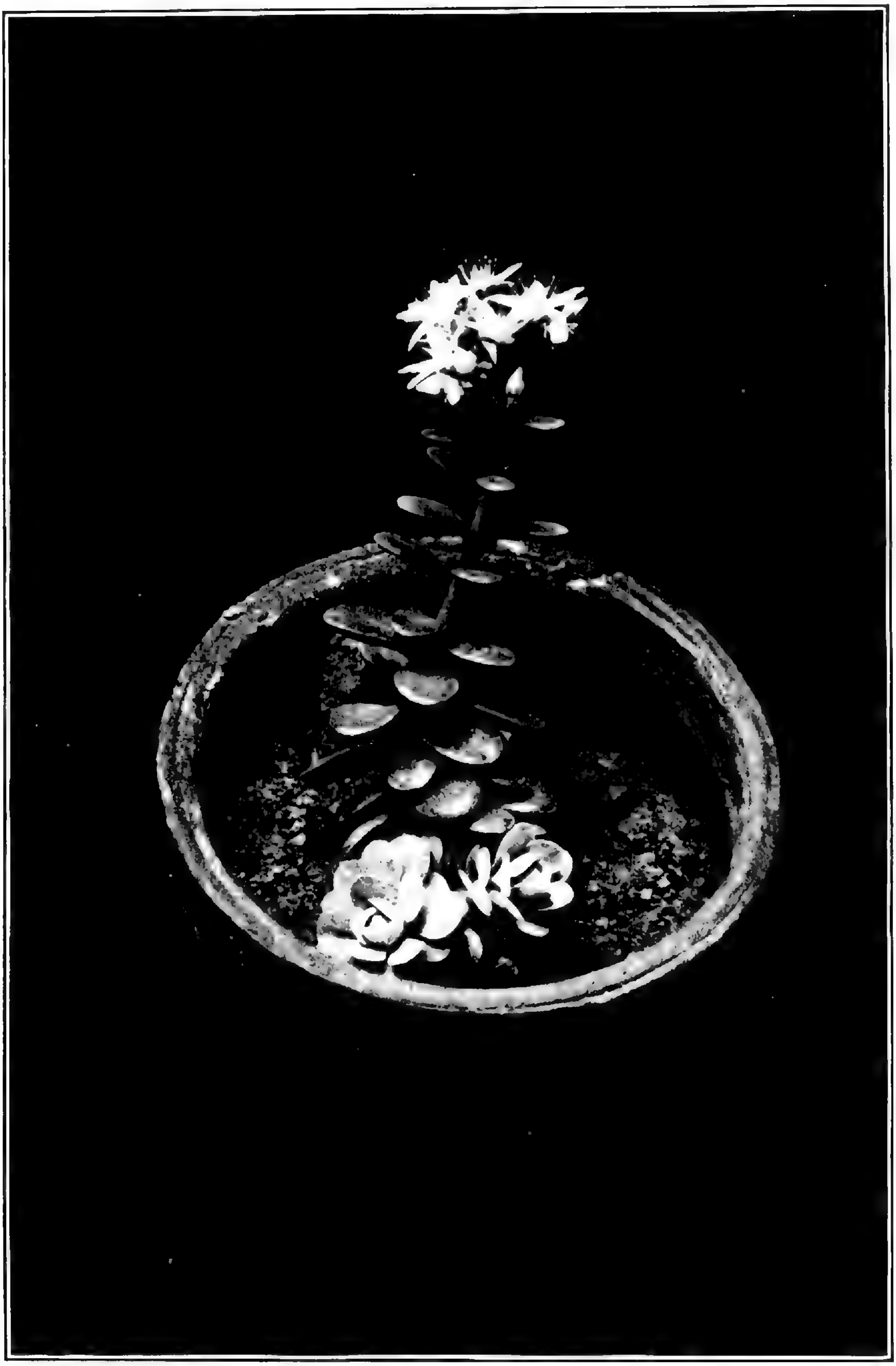
GRAPTOPETALUM PUSILLUM ROSE.

(Natural size.



SEDUM COMPACTUM ROSE.

Natural size.)



SEDUM FARINOSUM ROSE.

(Natural size.)

## FIFTEEN NEW AND ONE RESTORED SPECIES OF SEDUM.

**Sedum** (?) **clavifolium** Rose, sp. nov.

Perennial, branching at base and forming dense mats; basal and lower stem leaves 1 to 3 cm. long, thickened but flattened above, tapering below into long, slender, nearly terete petioles, obtuse; stem 1 to 3 cm. high (in cultivated specimens 8 cm.); stem leaves similar to the basal but smaller, alternate; inflorescence a few-flowered cyme; pedicels 5 to 8 mm. long; sepals 5, distinct, green, unequal, spreading, thick and club-shaped, rounded at the apex, all longer than the petals; petals widely spreading, or even reflexed between the sepals, somewhat cup-shaped beyond the sepals, obtuse, pale greenish yellow, about 3 mm. long; stamens 10, the five opposite the petals borne upon them, the other five distinct; scales 5, large, deep red, erect, more or less lobed and toothed at the apex; carpels 5, ovate, erect even in fruit, tipped by very short styles; seeds oblong, several in each cell.

Type U. S. National Herbarium no. 399592, derived from material collected by Dr. C. A. Purpus on rock above timber line, Ixtaccihuatl, State of Mexico, Mexico, in November, 1905 (no. 1681), and flowered in Washington in June, 1906.

This little plant is very tenacious of life, for the herbarium specimens collected in November, 1905, were sending out new leaves June 14, 1906.

This species is very unlike a true Sedum in its erect carpels, very large petaloid scales, reflexed petals, distinct sepals, etc.

In its flower structure it comes close to *Sedum longipes* Rose.

**Sedum compactum** Rose, sp. nov. PLATE 53.

Plants creeping, forming a dense, moss-like carpet; sterile branches small, bearing a compact rosette of leaves; leaves closely imbricated, narrowly oblong, 3 to 5 mm. long, obtuse, flattened but fleshy, glabrous; flowering branches ascending or erect, 3 or 4 cm. high, their leaves alternate, similar to those on sterile branches; flowers solitary, terminal, sessile; sepals similar to the leaves and about half the length of the petals; petals white, broadly ovate, 4 mm. long, cup-shaped within.

Type U. S. National Herbarium no. 574880, collected by C. A. Purpus on rocks, Cerro de Sentile, Oaxaca, Mexico, altitude 2,100 to 2,400 meters, 1907, and flowered in Washington, May and August, 1909 (no. 424).

This species much resembles *S. humifusum* Rose in habit and foliage, but it is not at all pubescent and the flowers are white, not yellow.

**Sedum delicatum** Rose, sp. nov.

Stems from small fleshy, fusiform tubers, 1 to 2 cm., or in cultivated specimens as much as 4 cm., high, usually simple below; leaves club-shaped, nearly terete in section, obtuse, alternate; inflorescence a few-flowered (2 to 5-flowered) cyme; pedicels slender, sometimes 15 mm. long; sepals 4 or 5, very unequal, similar to the leaves, the longer ones much exceeding the petals; petals white, 2 mm. long, obtuse, ascending; stamens 8 or 10; anthers purplish; carpels 5, widely spreading in age.

Type U. S. National Herbarium no. 474951, collected by Dr. C. A. Purpus on rocks near and above timber line on Ixtaccihuatl, State of Mexico, Mexico, 1905, and flowered in Washington in June, 1906.

This is a very peculiar species, perhaps nearest *S. minimum*, but with differently shaped tubers, differently colored flowers, etc.

**Sedum farinosum** Rose, sp. nov. PLATE 54.

Perennials, at first forming dense, elongated rosettes; flowering stems weak, ascending or spreading, about 10 cm. long, glabrous, whitish by a bloom especially noticeable in dried specimens; leaves flat but thickish, translucent, spatulate, broadest just below the rounded tip, 3 to 3.5 cm. long, glabrous; inflorescence a broad open cyme; pedicels 2 to 3 mm. long; sepals green, 2 to 3 mm. long, oblong, obtuse, distinct to or nearly to the base; petals white, spreading, lanceolate, 6 to 7 mm. long; stamens 10; carpels widely spreading, tipped by the slender styles.

Type U. S. National Herbarium no. 571201, collected by Dr. E. Palmer at San Ramon mining camp, 80 miles west of Durango City, April 21 to May 18, 1906 (no. 181).

This species grows on cliffs among moss. It resembles somewhat *S. spathulatum* but the flowers are pure white, not yellow. I have placed it next to *S. lumholtzii*, although that species is pubescent. I have had the plant in cultivation since 1906.

**Sedum flaccidum** Rose, sp. nov.

Roots thickened and probably perennial; stems annual, weak, much branched, 8 to 10 cm. long, glabrous, green or purplish; leaves alternate, turgid, ovate to linear-ovate in outline, 5 to 10 mm. long; flowers 2 to 5, rather scattered, forming an open secund raceme; pedicles often slender, 5 to 10 mm. long; sepals nearly distinct, green and leaf-like, nearly equal, 2 to 3 mm. long; corolla widely spreading; petals with a broad flat blade, spoon-shaped above and pointed at the apex, white but more or less banded, especially below, with red; stamens 10, five borne on the base of the petals, the other five distinct, curved outward; scales small, black; carpels at first erect but in age spreading; styles short.

Type U. S. National Herbarium no. 571538, collected by Dr. E. Palmer at Tejamon, Durango, Mexico, in August, 1906 (no. 513).

Undoubtedly a near relative of *S. napiferum* and *S. calcaratum*.

**Sedum frutescens** Rose, sp. nov.

Leaves linear, flattened, 2 to 6 cm. long, bright green, acute, closely set upon the branches, rounded and free at base; inflorescence a small, few-branched cyme; peduncle 1 cm. or less long; branches 3 to 4 cm. long; petals white, 5 to 6 mm. long, acuminate; carpels widely spreading.

Type U. S. National Herbarium no. 462340, collected by C. G. Pringle in flower in 1904 (no. 13266). The description is chiefly drawn from Mr. Pringle's material.

Living material of this species was collected by J. N. Rose on the rocky bluffs near El Parque, Morelos, in 1903 (no. 845) and sent to Washington. This material is still in cultivation, but has not yet flowered.

Very much resembling *S. oxypetalum* in size and habit, but with very different foliage and flowers.

**Sedum humifusum** Rose, sp. nov. PLATE 55.

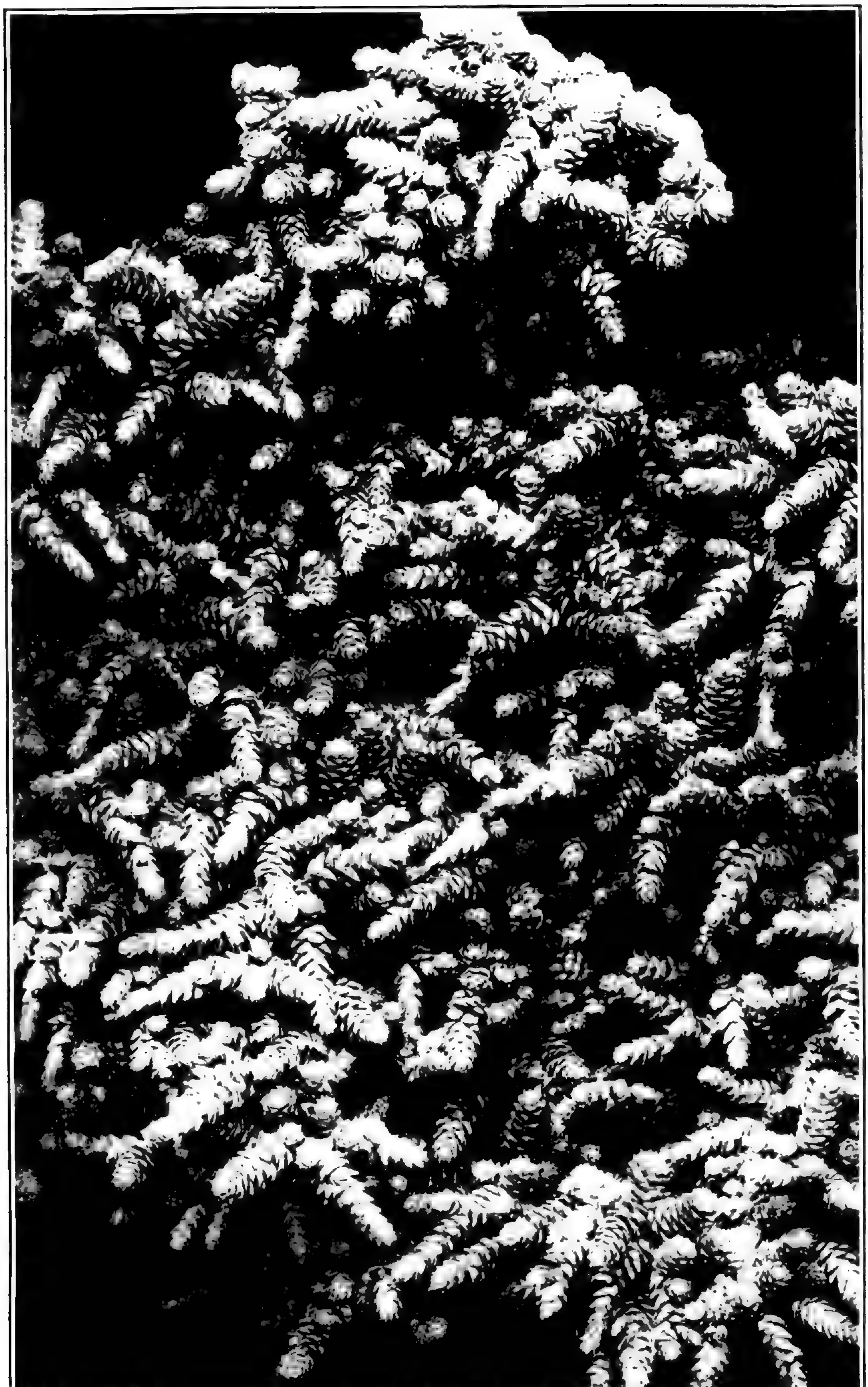
Plants creeping, forming a dense moss-like carpet, sending off hundreds of small branches 1 cm. or less long bearing a compact rosette of leaves; leaves closely imbricated, nearly orbicular, about 4 mm. in diameter, flattened but fleshy, ciliate; flowers solitary, terminal, the peduncle proper 1 cm. or less long, bearing a few leaves; sepals distinct or nearly so, leaf-like, very thick, ciliate, 2 mm. long; corolla about 10 mm. broad; petals yellow, distinct, widely spreading; stamens 10, erect; scales minute, orange-colored; carpels, in flower at least, erect.

Type U. S. National Herbarium no. 399703, derived from material collected by C. G. Pringle near San Juan del Rio, Querétaro, Mexico, in 1905, which flowered in Washington, April, 1906.

**Sedum lenophylloides** Rose, sp. nov.

Perennial, woody at base, 5 to 30 cm. high, somewhat branched, the branches strict; leaves at right angles to the stem, closely set, usually alternate, but the lower ones either opposite or subopposite, 10 to 15 mm. long, very turgid, rarely subterete, rounded below, somewhat trough-shaped above, acutish, often purplish; inflorescence a short terminal panicle; sepals green, ovate; petals greenish white, lanceolate; stamens 10, the five opposite the petals borne on these, the other five distinct; scales large, orange-colored; styles elongated, slender; carpels erect at first, afterwards more or less spreading.

Type U. S. National Herbarium no. 574882, collected in the mountains of Monterey, Mexico, by C. G. Pringle in September, 1907. Mr. Pringle had collected the same in 1903, and this collection has been growing in Washington since that time, but did not flower until September, 1907.



SEDUM HUMIFUSUM ROSE.

(Scale one and one-half.)



SEDUM LIEBMANNIANUM HEMSL.

(Natural size.)

SEDUM MELLITULUM ROSE.

(Scale two-fifths.)



SEDUM PACHYPHYLLUM ROSE.

(Natural size.)

This species is reluctantly referred to Sedum, although in habit and foliage it suggests Lenophyllum.

**Sedum liebmannianum** Hemsl. PLATE 56.

Perennial, procumbent and creeping, freely rooting at the joints, with ascending or erect branches; branches when young fleshy, green, when old completely hidden by the white bases of the dead leaves; leaves fleshy, narrow, bright green, 4 to 6 mm. long, generally obtuse, broad at the base; flowers few, in small cymes; pedicels subsessile; sepals linear, leaf-like; petals white, spreading; anthers purplish, oblong; scales short, retuse; ovaries oblong, erect, longer than the styles.

Collected by C. A. Purpus on limestone slope of Mesa de Coscomati, Oaxaca, Mexico (no. 422). Living material was sent to Washington, which flowered in June, 1909.

I at first considered this species undescribed and was about to publish it as such when I discovered that it was probably *Sedum liebmannianum*, which species has recently been referred to *Sedum moranense*. My reference of it to *Sedum liebmannianum* has been confirmed at Kew, although its distinctness from *Sedum moranense* is questioned. Living material of both species has long been under observation in Washington and their distinctness can hardly be questioned.

**Sedum mellitulum** Rose, sp. nov. PLATE 57.

Small, compact, much branched at base, the individual stems at first erect and nearly simple or in age becoming decumbent, very slender, pinkish, glabrous but slightly roughened; leaves scattered, standing nearly at right angles to the stem, terete, blunt, glabrous, 6 to 8 mm. long, bright green; inflorescence an open spreading cyme of 2 or 3 branches, each branch bearing 3 to 8 flowers; pedicels short (about 2 mm. long); sepals nearly or quite distinct, linear, 3 to 4 mm. long; petals a little longer than the sepals, widely spreading, white; filaments white; anthers brownish; pistils white, erect; mature carpels erect.

Type U. S. National Herbarium no. 617435, from material which flowered in Washington, D. C., originally sent by Marcus E. Jones, who collected it in the Sierra Madre, 30 miles west of Colonia Juarez, Chihuahua, in 1903. Material has been in cultivation in Washington for over seven years under the name of *S. alamosanum*, as which it has been widely distributed. In 1910 the writer collected the true *Sedum alamosanum*, which has since been grown side by side with the present species. The two species are related but can easily be distinguished.

**Sedum oaxacanum** Rose, sp. nov.

Stem creeping, rooting at the joints, reddish, somewhat roughened; leaves rather closely set but not imbricated, usually standing nearly at right angles to the stem, thick but not terete, rounded on the back, flat on the face, obtuse, with broad base, glabrous, 5 to 6 mm. long; flowers solitary, terminal, sessile, or sometimes as many as 4 in a small terminal cyme; sepals linear, 3 mm. long, distinct nearly to the base; petals yellow, distinct, longer than the sepals; stamens 10; carpels 5, widely spreading, with long styles.

Type U. S. National Herbarium no. 462270, collected by Dr. C. G. Pringle on mossy ledges of Cerro San Felipe, Oaxaca, May 18, 1906 (no. 10243).

Living material was sent me by Prof. C. Conzatti, but it died in a short time. Unfortunately it was not photographed.

It is not near any of our other known Mexican species, but suggests somewhat *S. australe* of Guatemala, than which it is a weaker plant with smaller leaves.

**Sedum pachyphyllum** Rose, sp. nov. PLATE 58.

Perennial; stems woody at base, much branched, spreading or erect, glabrous throughout, 10 to 30 cm. high; leaves closely set, standing almost at right angles to the stem, terete in section, somewhat smaller below, obtuse, a little glaucous, 3 to 4 cm. long, 8 to 10 mm. in cross section; flowering stem weak, about 2 cm. long; inflorescence sessile, cymose; flowers short-pediceled or subsessile; sepals 5, widely spreading, clavate, green, obtuse, somewhat unequal, the longest one 6 mm. long; petals

yellow, widely spreading, or even bent backward, 7 mm. long, somewhat keeled on the back, spoon-shaped above; stamens 10, yellow; carpels at first erect, yellow.

Type U. S. National Herbarium no. 618380, collected by Dr. C. A. Purpus on hills near San Luis, Oaxaca, Mexico, altitude 1,800 to 2,100 meters, in 1907 (no. 416) and flowered in Washington, January, 1910.

Resembling *Sedum allantoides*, but leaves much less glaucous and flowers yellow instead of white.

**Sedum potosinum** Rose, sp. nov.

Stems low and weak, at first erect, but soon prostrate or at most ascending; leaves closely set, ascending, nearly terete, obtuse, 6 to 8 mm. long, pale green, glabrous, slightly glaucous; inflorescence (usually?) an equilateral raceme; pedicels short, 1 to 2 mm. long; sepals linear, distinct nearly to the base, 3 mm. long; petals white or slightly tinged with pink, widely spreading, 6 to 7 mm. long.

Type U. S. National Herbarium no. 615397, collected by Dr. E. Palmer near San Luis Potosí, Mexico, in 1905, and flowered in Washington in May, 1905, and June, 1908.

Here also seems to belong Parry & Palmer's no. 236, which was referred to *S. greggii* by Mr. Hemsley.

**Sedum rhodocarpum** Rose, sp. nov. PLATE 59.

Perennial; 10 to 20 cm. high; stems flaccid, glabrous, somewhat 3-angled, bearing 3 to 6 whorls of leaves; leaves in 3's, flattened, rather thin, orbicular to spatulate, 2 to 4 cm. long, rounded at apex or sometimes retuse, narrowed at base into a short petiole; inflorescence cymose, few-flowered or sometimes reduced to one flower; pedicels 2 to 10 mm. long, often bearing a single bract near the middle; calyx green, deeply 5-parted; lobes often a little longer than the petals, obtuse, spreading, fleshy, 6 to 7 mm. long; petals distinct, broadly ovate, acute, reddish, in anthesis reflexed; stamens red, 10, the five alternating with the petals distinct, the other five borne on the base of the petals; carpels red, at first erect but in age widely spreading.

Type U. S. National Herbarium no. 462503, collected by C. G. Pringle on limestone ledges of the Sierra Madre above Monterey, Mexico, altitude 1,800 meters, December 21, 1906 (no. 10368), and flowered in Washington, November 19, 1907, and in 1909.

**Sedum semiteres** Rose, sp. nov.

Perennial; sterile branches 3 to 4 cm. long, very leafy, the leaves appearing imbricate, in cultivated specimens 10 cm. long, the leaves standing nearly at right angles to the stem or somewhat drooping; leaves 1 to 2 cm. long, narrow, fleshy, nearly semiterete in section, obtuse, strongly papillose, the papillæ appearing more pronounced in dry specimens; flowering stems ascending or erect, apparently very leafy, 10 to 20 cm. long; inflorescence a widely spreading cyme more or less papillose; pedicels slender, 2 to 3 mm. long; calyx deeply cleft, the lobes ovate, 2 mm. long, obtuse; petals 5, white, lanceolate, acuminate, 5 mm. long; anthers dark-colored; carpels spreading, papillose-roughened, tipped by long, slender styles.

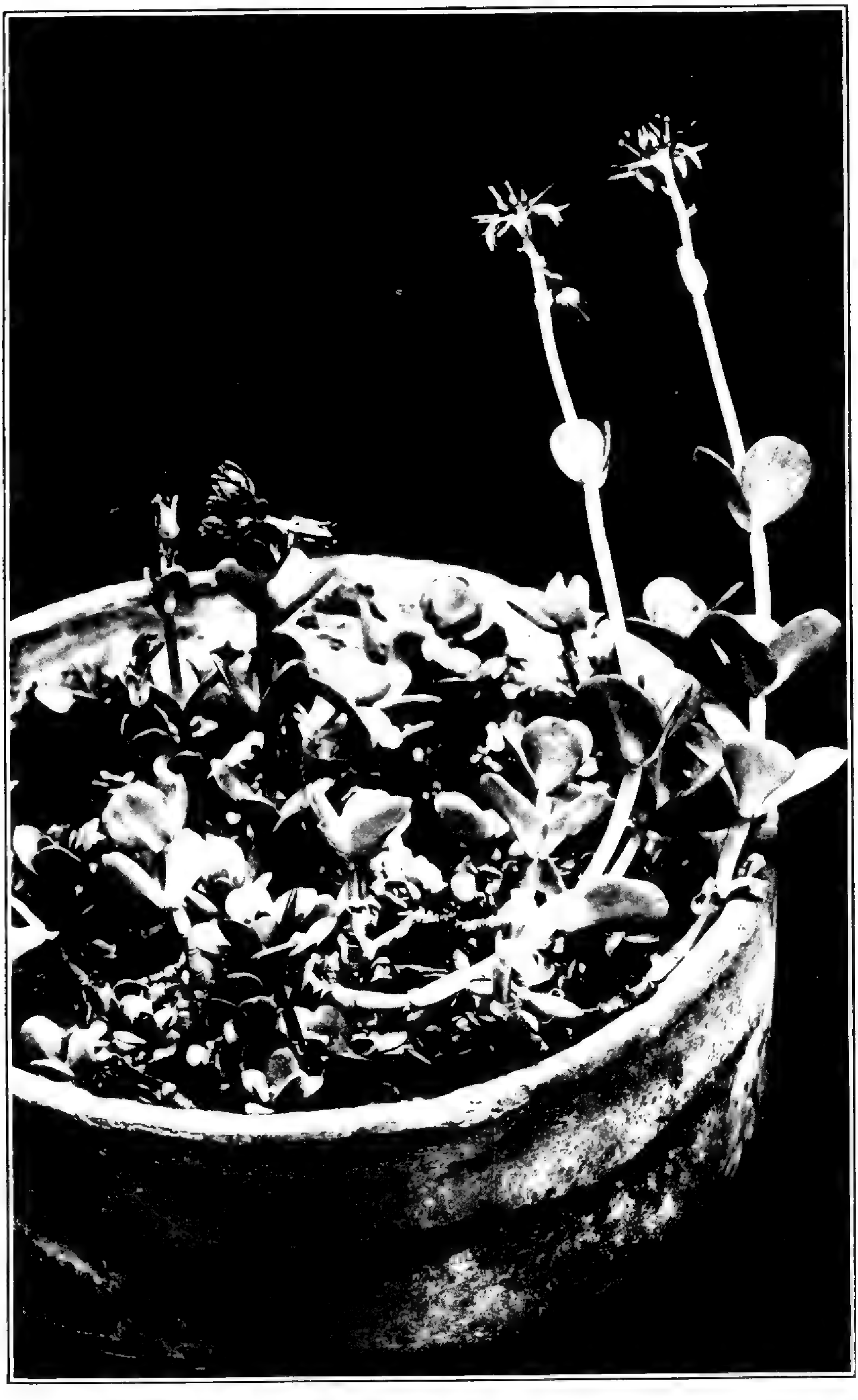
Type U. S. National Herbarium no. 571200, collected by Dr. E. Palmer at San Ramón, Durango, Mexico, 1906 (no. 180).

This species is nearest *S. alamosanum*, but is stouter and has more flattened, papillose leaves and white flowers.

The species is in cultivation in Washington.

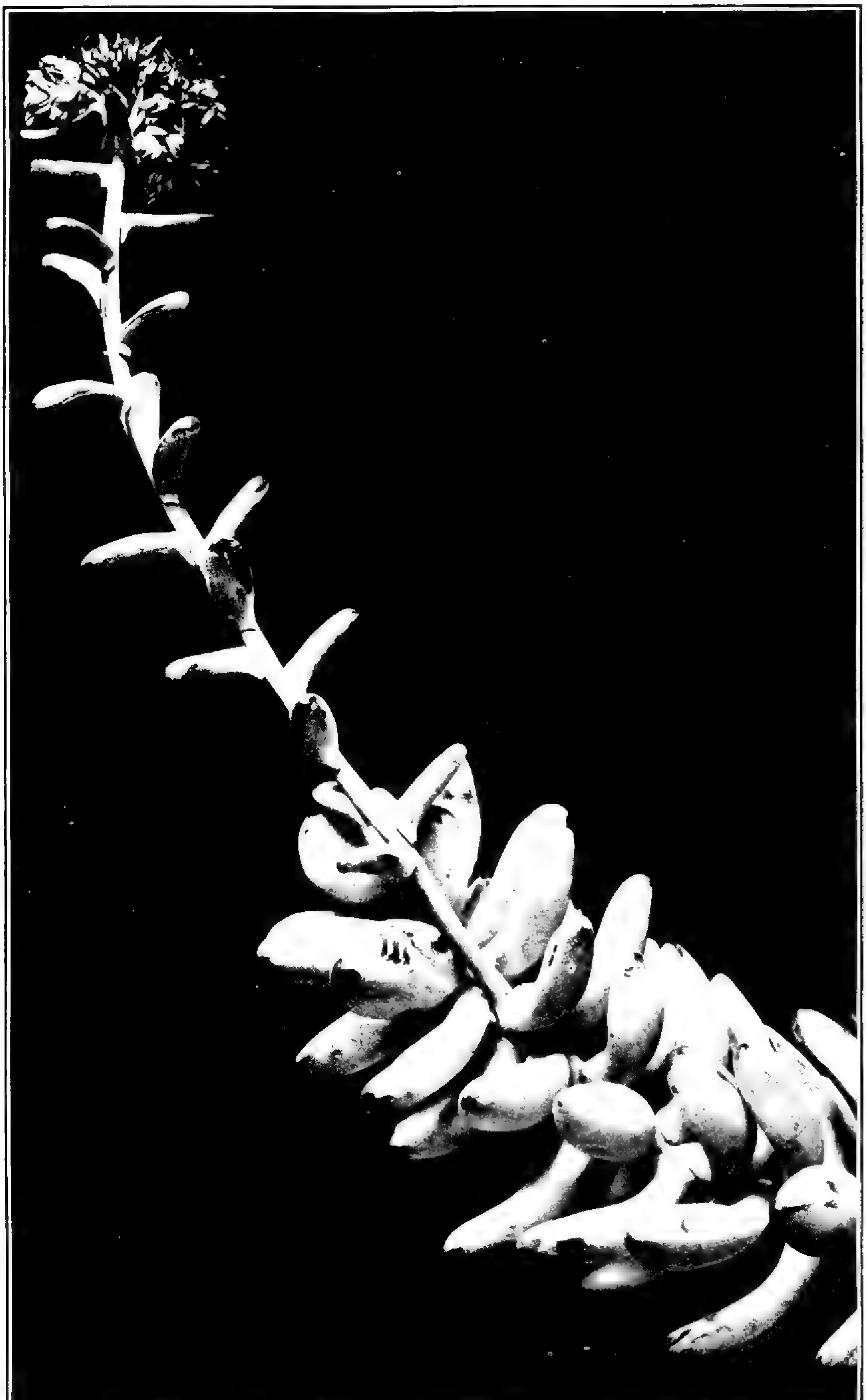
**Sedum treleasei** Rose, sp. nov. PLATE 60.

Perennial; stems woody at base, numerous, at first erect but finally procumbent and even pendulous in its native haunts, glaucous; leaves closely set, especially toward the ends of the branches, standing nearly at right angles to the stems, very glaucous, thick but decidedly flattened, 2.5 to 3.5 cm. long, obtuse, rounded below with the tip slightly turned up, the upper face slightly concave; flowering branches weak, slender, ascending or drooping, arising from the axils of upper stem-leaves, pinkish, the leaves narrow, obtuse; cymes sessile, small, about 3 cm. broad, compact; pedicels very short;



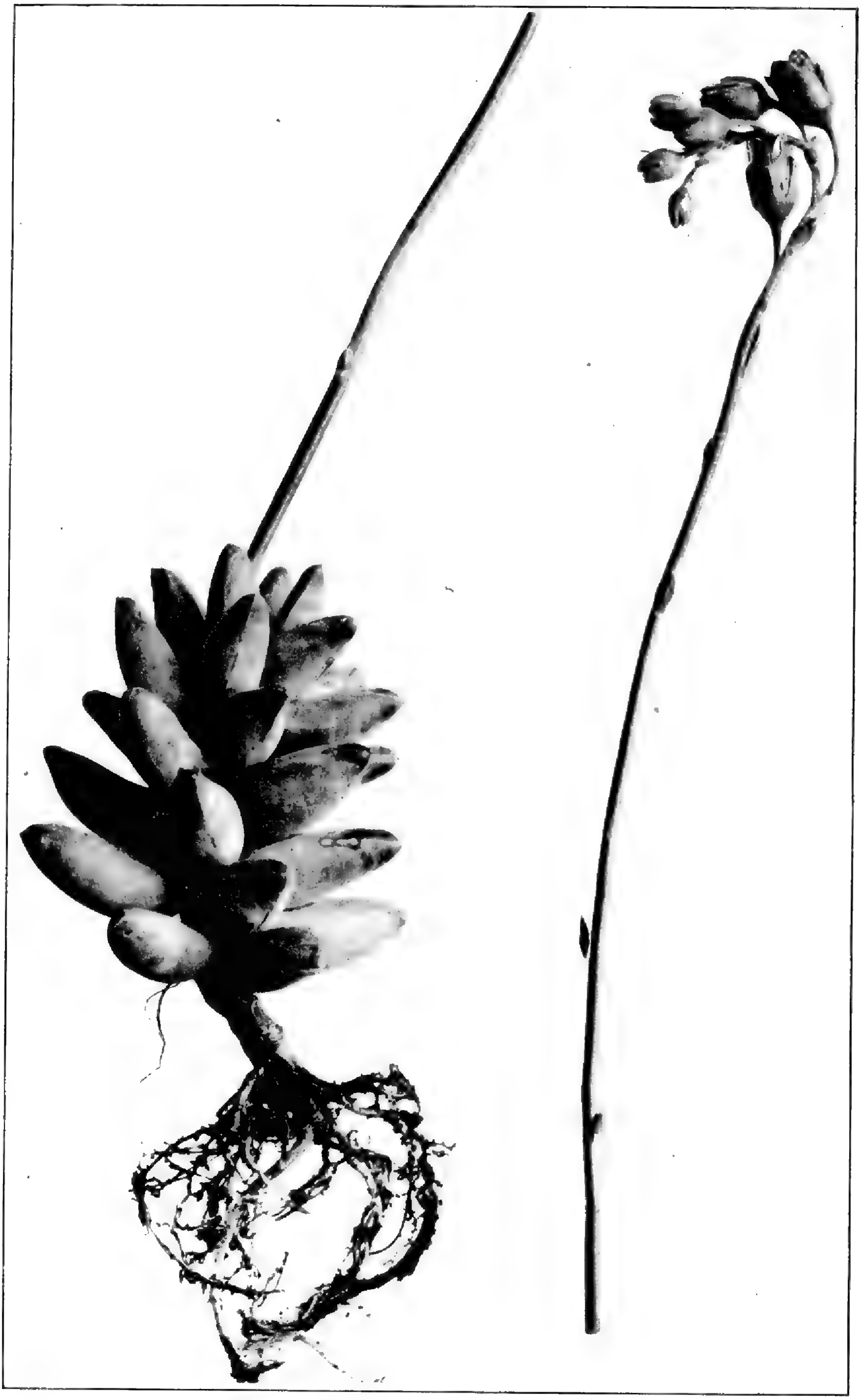
SEDUM RHODOCARPUM ROSE.

(Natural size.)



SEDUM TRELEASEI ROSE.

Natural size.



PACHYPHYTUM COMPACTUM ROSE.

(Natural size.)

sepals 5, linear, acute, terete, 3 mm. long; petals yellow, 6 mm. long, lanceolate, acute, widely spreading or sometimes turned backward; stamens 10, erect, yellow; carpels 5, long-attenuate, yellow, at first erect; scales yellow, broad.

Type U. S. National Herbarium no. 618379, collected by J. N. Rose near Tehuacán, Mexico, in 1905, and flowered first in Washington in 1910.

Named for Dr. Wm. Trelease, who first collected material (in 1904), but whose specimens have not yet flowered with me.

## NEW SPECIES OF FOUR GENERA.

**Tilleastrum latifolium** Rose, sp. nov.

Delicate annual, 2 to 3 cm. high; leaves opposite, somewhat connate at base, 1 or 2 pairs below the flowers, the upper ones congested, lanceolate, acute or even apiculate, the margin serrulate; flowers axillary and solitary but often appearing as if in an umbel of 10 or more; pedicels filiform, 10 to 15 mm. long; sepals 3 or 4, filiform, 2.5 mm. long; petals broadly oval to orbicular, 1 mm. long, shorter than the carpels; stamens 3 or 4; carpels 3 or 4, purplish, each 10 or more seeded.

Type U. S. National Herbarium no. 451508, collected by J. N. Rose and J. H. Painter on the side of the Nevada de Toluca, Mexico, October 15, 1903 (no. 7891).

This species is not closely related to any of the Mexican species of the genus.

**Tilleastrum longipes** Rose, sp. nov.

Stems simple, erect, about 2 cm. high; leaves linear, acute, 1 mm. or less broad; peduncles slender, filiform, weak, 2 to 4 mm. long, sometimes much longer than the leaves; sepals green, about half as long as the petals; seeds several, oblong in outline, smooth.

Type U. S. National Herbarium no. 401957, collected by C. G. Pringle on river ledges at Trinidad, Hidalgo, May 10, 1904 (no. 13407).

Very different from both *T. viride* and *T. pringlei* in its long peduncles.

**Pachyphytum compactum** Rose, sp. nov. PLATE 61.

Caulescent, 10 cm. or more high; leaves closely set at right angles to the stem, very fleshy but somewhat flattened, more or less purplish, somewhat glaucous, pointed, 2 to 2.5 cm. long; flowering stem 40 cm. long, more or less highly colored; stem leaves small (10 cm. long); flowers 7 to 10, racemose; lower pedicels 10 to 15 mm. long, the upper shorter; sepals appressed to the corolla, nearly equal, reddish below but with greenish tips, acute; corolla 8 mm. long; petals broad, reddish except the green tips, acute; stamens opposite the petals appendaged.

Type U. S. National Herbarium no. 574499, collected by C. A. Purpus at Ixmiquilpan, Hidalgo, Mexico, March, 1910.

It did not flower in cultivation until March, 1910.

Resembling *P. brevifolium* but with longer leaves and acute instead of obtuse sepals and petals.

**Urbinia lurida** Rose, sp. nov.

Leaves clustered in a dense rosette, very thick, ovate, acuminate, glabrous, purple or lurid in color, 3 to 4 cm. long, 1.5 to 2.5 cm. broad at widest point; flowering stem 25 cm. long, two-branched in only specimen seen; stem leaves small, bract-like, scattered; sepals small, ovate, acute; corolla 6 to 7 mm. long; petals acute, erect except the small outturned tip; carpels distinct to the base.

Type U. S. National Herbarium no. 571269, collected by Dr. E. Palmer in a "box cañon" near Tobar, Durango, Mexico, May 28, 1906 (no. 248). Only four specimens were obtained, of which two reached Washington in good condition, one of them flowering April 22, 1908. From this the accompanying illustration was made. This plant died soon afterwards, while the only remaining plant has not done well and

probably will soon disappear. This species is much smaller than any of the other three species of Urbinia and has much more highly colored leaves.

**Urbinia purpusii** Rose, sp. nov.

Acaulescent; leaves forming a very compact rosette, resembling in a most remarkable way certain species of Haworthia, broadly ovate, acuminate, 3 cm. long, nearly as broad at base, glabrous, the surface peculiarly mottled with brown; flowering stem more or less reddish, 30 cm. long, slender, bearing numerous small, ovate, acute, appressed leaves; inflorescence a few-flowered (6-flowered in the only one examined) raceme; pedicels of lowermost flower 6 mm. long, the upper ones shorter still; sepals small, ovate, acute, green, appressed to the flower; corolla somewhat urn-shaped, 10 to 12 mm. long, pinkish without, except toward the tip, this and the inner surface pale yellow; mouth of corolla small; petals acute, each bearing a large pocket at the base; stamens 10, the alternating ones nearly or quite distant; the other 5 borne on the adjoining petals just above the pocket; ovaries short, stigmas green.

Type U. S. National Herbarium no. 615402, collected by the Purpus brothers (C. A. and J. A.) in southern Mexico in 1909.

**Villadia diffusa** Rose, sp. nov.

Perennial, much branched and somewhat woody at base; branches glabrous, somewhat angled in dried specimens, purplish; leaves alternating, in young shoots forming small rosettes or closely overlapping and covering the stems, triangular to ovate, usually broadest at base, obtuse, 6 mm. long, glabrous; inflorescence an open spike, 2 to 12 cm. long; flowers subtended by a leaf-like bract; sepals 2 to 3 mm. long, ovate, obtuse, green; corolla about 6 mm. long, pinkish, the lobes acute, the tube about one-fourth the whole length; stamens borne on the corolla tube; styles slender.

Type U. S. National Herbarium no. 574298, collected by G. N. Collins and C. B. Doyle on Sierra Blanca, Chiapas, Mexico, January 20, 1907 (no. 131).

## MENISPERMACEAE.

### A NEW SPECIES OF MENISPERMUM.

In 1907 Dr. C. G. Pringle collected in northern Mexico a species of Menispermum. This was especially interesting since the genus had not heretofore been reported from Mexico. Doctor Pringle at first took it to be the common United States species, *M. canadense*, but a careful comparison with that species shows that it is abundantly distinct.

**Menispermum mexicanum** Rose, sp. nov.

Stem climbing, slender, slightly pubescent; petioles 3 to 5 cm. long; blade ovate, entire, 3 to 5-lobed, 4 to 7 cm. broad, mucronate-tipped, thin, slightly pubescent on both sides but more so beneath, here paler but never glaucous; flower not known; peduncles short (2 cm. long); clusters of fruit rather large and dense; drupes bluish black, 5 mm. broad.

Type U. S. National Herbarium no. 462662, collected by Dr. C. G. Pringle in the Sierra Madre near Monterey, Mexico, July 9, 1907 (no. 10378).

This species differs from *M. canadense* in its leaves not being glaucous beneath, in its larger drupes, and in its much more southern range.

## CAESALPINIACEAE.

### NEW SPECIES AND NEW BINOMIALS IN POINCIANA.

**Poinciana californica** (A. Gray) Rose.
*Caesalpinia mexicana californica* A. Gray, Proc. Amer. Acad. **5:** 157. 1862.

**Poinciana conzattii** Rose, sp. nov.
A small tree; bark grayish, glabrous; leaves glabrous throughout, large; pinnæ commonly in 4 pairs, but sometimes with an odd one; leaflets 4 or 5 pairs, oblong to obovate, 15 to 22 mm. long, rounded or retuse at apex; inflorescence a sessile raceme, 6 to 15 cm. long, glabrous; pedicels about 15 mm. long, slender, jointed above the middle; sepals highly colored, obtuse; petals yellowish red, about twice as long as the sepals; stamen long-exserted, 3 cm. long, somewhat hairy at base; pods scythe-shaped, 5 to 6 cm. long; clothed with a short, close pubescence; seed flat, 8 mm. broad.
Type U. S. National Herbarium no. 841055, collected by Hugo and C. Conzatti at Tehuantepec, Mexico, in 1909 and now in cultivation in the Botanical Garden in Oaxaca City.

**Poinciana melanadenia** Rose, sp. nov.
A low, bushy shrub; branches short, nearly black; leaves with 3 pinnæ; petiole and rachis both glandular and thinly pilose, slender; leaflets 4 to 6, oblong, 5 to 8 mm. long, obtuse, pubescent or glabrate with black glands along the margins; peduncle short; inflorescence usually a raceme, short, sometimes 15-flowered but sometimes 1-flowered; pedicels bearing stipitate glands, otherwise smooth, jointed above the middle; stamens a little longer than the petals, hairy at base; pods 3 cm. long, scythe-shaped, pubescent and bearing large sessile glands.
Type U. S. National Herbarium no. 454032, collected by J. N. Rose, near Tehuacán, September 1, 1906 (no. 11249).

**Poinciana mexicana** (A. Gray) Rose.
*Caesalpinia mexicana* A. Gray, Proc. Amer. Acad. **5:** 157. 1862.

**Poinciana palmeri** (S. Wats.) Rose.
*Caesalpinia palmeri* S. Wats. Proc. Amer. Acad. **24:** 47. 1889.

**Poinciana pannosa** (Brandegee) Rose.
*Caesalpinia pannosa* Brandegee, Proc. Cal. Acad. II. **2:** 150. 1889.

**Poinciana placida** (Brandegee) Rose.
*Caesalpinia placida* Brandegee, Proc. Cal. Acad. II. **3:** 131. 1891.

**Poinciana sessiliflora** (S. Wats.) Rose.
*Caesalpinia sessiliflora* S. Wats. Proc. Amer. Acad. **21:** 450. 1886.

## OXALIDACEAE.

### NEW AND RECENTLY DESCRIBED SPECIES OF IONOXALIS.

In 1906 I published in the Contributions a partial report upon the very large series of specimens of Ionoxalis which had accumulated in the National Herbarium. About this time Dr. J. K. Small was finishing his revision of the Oxalidaceae for the North American Flora and I therefore turned over to him all my notes and specimens. Of the 65 species which he treated all but 9 are Mexican and nearly all (at least 60) are represented by material in the National Herbarium. Of these about 40 had been collected by me; of the new ones described 14 were of my collecting. Two species additional to those in the North American Flora are also here described.

**Ionoxalis calcaria** Small, N. Amer. Flora **25**[1]: 37. 1907.

Plants 5 to 15 cm. tall, erect, the bulb scales several-ribbed; leaves as tall as the scape or nearly so, the petiole finely pubescent; leaflets 3, the blades lunate, 10 to 23 mm. wide, dark green and glabrous above, pale and sparingly pubescent beneath, the lobes ovate to lanceolate; scapes very sparingly pubescent; cymes 5 to 14-flowered; pedicels 0.5 to 1.5 cm. long, glabrous or nearly so; sepals lanceolate to linear-lanceolate, 2.5 to 3.5 mm. long, glabrous, each bearing 2 rather long apical tubercles; petals white, 6 to 9 mm. long; shorter filaments glabrous; longer filaments pubescent, each with an appendage on the back near the base.

Type collected on Mount Alban, near the city of Oaxaca, Oaxaca, Mexico, June 16 to 21, 1899, by J. N. Rose and Walter Hough (no. 4589).

**Ionoxalis divaricata** Small, N. Amer. Flora **25**[1]: 33. 1907.

Plants 10 to 30 cm. tall, the bulb scales many-ribbed; leaves fully half as tall as the scape, or equaling it, the petioles glabrous, at least above the base; leaflets 4, the blades 2 to 5 cm. long, open V-shaped with the 2 oblong-ovate lobes rather spreading, bright green above, paler beneath, with scattered hairs on both surfaces; scape glabrous; cymes 3 to 11-flowered; pedicels 1.5 to 3 cm. long, glabrous; sepals lanceolate or oblong-lanceolate, 4.5 to 5 mm. long, glabrous, each bearing 2 short apical tubercles; petals violet, 12 to 16 mm. long; shorter filaments glabrous; longer filaments pubescent above, each with an appendage below the middle.

Type collected near Tlalpam, Valley of Mexico, July 15, 1901, by J. N. Rose and Robert Hay (no. 5494).

**Ionoxalis goldmanii** Rose, sp. nov.

Bulbs deep-seated, the brown scales 7-nerved; petioles about 20 cm. long, somewhat pubescent; leaflets 5 or 6, broadly obovate, rounded at apex, 4 to 6 cm. long, 3 to 4 cm. broad, somewhat hairy, especially toward the base; peduncles much longer than the leaves, more or less pubescent; cymes 10 to 15-flowered, pedicels 15 mm. long, glandular-pubescent; sepals lanceolate; lower stamens pubescent, appendaged on the back; style pubescent.

Type U. S. National Herbarium no. 470828, collected by E. A. Goldman at Jiquipelas, Chiapas, Mexico, May 31, 1909 (no. 1033).

Perhaps nearest *I. rosei*, but with different leaflets, etc.

**Ionoxalis immaculata** Small, N. Amer. Flora **25**[1]: 41. 1907.

Plants 8 to 20 cm. tall, the bulb scales 3-ribbed; leaves over half as tall as the scape, the petioles glabrous; leaflets 3, the blades obdeltoid in outline, 1 to 1.5 cm. wide, glabrous, bright green above, paler beneath, the lobes broadly ovate; scapes glabrous; cymes 4 or 5-flowered; pedicels 1.5 to 3 cm. long, glabrous; sepals linear to linear-oblong, 4 to 4.5 mm. long, glabrous, each bearing two very narrow apical tubercles; petals white, 11 to 13 mm. long; shorter filaments glabrous; longer filaments pubescent, unappendaged; styles pubescent; capsules columnar, about 10 mm. long, glabrous.

Type collected on Sierra de Pachuca, Hidalgo, Mexico, July 21 and 22, 1901, by J. N. Rose and Robert Hay (no. 5545).

**Ionoxalis lanceolata** Small, N. Amer. Flora **25**[1]: 35. 1907.

Plants 10 to 20 cm. tall, the bulb scales 3-ribbed; leaves as tall as the scape or nearly so, the petioles finely pubescent or partially glabrous in age; leaflets mostly 5 to 7, the blades 2 to 9 cm. long, typically lanceolate, sometimes narrowly so, those of the earlier leaves inclined to be broadened upward or rarely obovate, the narrower ones acute or acutish, bright green above, paler beneath or glaucescent, usually sparingly pubescent, especially on the lower surface and on the margins; scapes glabrous or nearly so; cymes 1 to 4-flowered; pedicels 1 to 3 cm. long, glabrous; sepals lanceolate or linear-lanceolate, 5 to 6 mm. long, glabrous except the ciliolate margins, acute, each bearing two rather elongate apical tubercles; petals lilac, 14 to 18 mm. long; shorter fila-

ments glabrous; longer filaments pubescent near the tip, unappendaged; styles mostly pubescent; capsules columnar, 9 to 11 mm. long, glabrous.

Type collected at Colomas, Sinaloa, Mexico, July 15, 1897, by J. N. Rose (no. 1651).

**Ionoxalis macilenta** Small, N. Amer. Flora **25**[1]: 35. 1907.

Plants 3 to 7 cm. tall, the bulb scales 3-ribbed; leaves as tall as the scape or nearly so, the petioles glabrous or with few scattered hairs near the top; leaflets mostly 4, the blades 7 to 13 mm. long, obovate to spatulate-obovate, obtuse at the apex, bright green above, glaucous beneath, often with scattered hairs on the upper surface near the margin; scapes glabrous or nearly so; cymes 1 or 2-flowered; pedicels about 1 cm. long, glabrous; sepals linear to linear-lanceolate, 3 to 4 mm. long, glabrous, each bearing two rather short apical tubercles; petals white, 13 to 16 mm. long; shorter and longer filaments pubescent, unappendaged.

Type collected between Santa Gertrudis and Santa Teresa, Tepic, Mexico, August 8, 1897, by J. N. Rose (no. 3323).

**Ionoxalis magnifica** Rose, N. Amer. Flora **25**[1]: 31. 1907.

Plants 15 to 40 cm. tall, the bulb scales several-ribbed; leaves fully one-half as tall as the scape or less, the petioles finely pubescent; leaflets mostly 7 or 8, the blades cuneate, 2.5 to 4 cm. long, truncate or abruptly short-pointed, deep green above, slightly paler beneath, usually with scattered hairs on both sides; scapes glabrous; cymes mostly 12 to 24-flowered; pedicels 1.5 to 2.5 cm. long, glabrous or finely pubescent under the calyx; sepals linear-lanceolate to narrowly lanceolate, 5 to 6 mm. long, pubescent, each bearing four, usually long and irregular, more or less confluent apical tubercles; petals dark purple, 17 to 27 mm. long; shorter and longer filaments glabrous, the latter appendaged on the back; styles pubescent; capsules slender, about 1 cm. long.

Type collected at Alturas de Matatlan, Oaxaca, Mexico, June 19–23, 1906, by C. Conzatti (no. 1491).

**Ionoxalis mucronata** Rose, N. Amer. Flora **25**[1]: 40. 1907.

Plants 20 to 30 cm. tall, the bulb scales several-ribbed; leaves mostly less than one-half as tall as scape, the petioles glabrous, except for some hairs below the leaf blade; leaflets 3, the blades obdeltoid, only slightly emarginate or truncate at the apex, glabrous, bright green above, glaucous beneath; scape glabrous; cymes about 9-flowered; pedicels 1 cm. long or slightly longer at maturity, glabrous; sepals linear to oblong-lanceolate, 4.5 to 5 mm. long, glabrous, each bearing two long apical tubercles; petals violet, 12 to 14 mm. long; shorter filaments glabrous; longer filaments pubescent, each with an appendage on the back below the mildde.

Type collected on Sierra de Tepoxtlan, Morelos, Mexico, September 21, 1903, by J. N. Rose and J. H. Painter (no. 7247).

**Ionoxalis painteri** Rose, N. Amer. Flora **25**[1]: 34. 1907.

Plants 5 to 15 cm. tall, the bulb scales many-ribbed; leaves fully one-half as long as the scape, the petioles glabrous; leaflets mostly 7 to 9, the blades 1 to 2.5 cm. long, cuneate, sometimes narrowly so, notched to above the middle, bright green above, glaucous beneath, ciliate; scapes glabrous; cymes 5 to 11-flowered; pedicels 1 to 1.5 cm. long, glabrous or nearly so; sepals oblong, 3 to 4 mm. long, obtuse, glabrous, each bearing two short apical tubercles; petals violet, 8 to 11 mm. long; shorter and longer ones appendaged on the back; styles pubescent; capsules oblong, 6 to 9 mm. long.

Type collected between Pachuca and Real del Monte, Hidalgo, Mexico, August 31, 1903, by J. N. Rose and J. H. Painter (no. 6705).

**Ionoxalis quadriglandula** Rose, N. Amer. Flora **25**[1]: 40. 1907.

Plants 10 to 15 cm. tall, the bulb scales 3-ribbed; leaves fully one-half as tall as the scape, the petioles glabrous; leaflets 3, the blades lunate, 1.5 to 2.5 cm. wide, bright-green above, glaucescent beneath, glabrous, the lobes ovate; scape sometimes sparingly pubescent on the lower part; cymes 4 or 5-flowered; pedicels 1 to 2.5 cm. long,

glabrous; sepals lanceolate to oblong-lanceolate, 4 to 5 mm. long, glabrous, each bearing four long and narrow apical tubercles; petals violet, 11 to 14 mm. long; shorter filaments with few spreading hairs; longer filaments pubescent with shorter hairs, each one appendaged on the back below the middle.

Type collected on Sierra de Tepoxtlan, Morelos, Mexico, May 28, 1904, by C. G. Pringle (no. 8821).

**Ionoxalis rosei** Small, N. Amer. Flora **25**[1]: 32. 1907.

Plants 25 to 60 cm. tall, the bulb scales several-ribbed; leaves, at least some of them, often nearly as tall as the scape, the petioles nearly glabrous, or with scattered hairs; leaflets 4 or 5, the blades 2 to 4 cm. long, obdeltoid, slightly retuse at the apex, pubescent at the base, bright green and almost glabrous above, paler or sparingly pubescent beneath; scape commonly bearing a few hairs near the inflorescence; cymes 6 to 15-flowered; pedicels 1 to 2.5 cm. long, minutely viscid-pubescent; sepals lanceolate to linear-lanceolate, 4.5 to 5.5 mm. long, minutely pubescent, each with two short apical tubercles; petals violet, 15 to 20 mm. long, shorter filaments glabrous; longer filaments copiously pubescent, each with a prominent appendage near the base.

Type collected near Tlalnepantla, Mexico, July 6, 1905, by J. N. Rose, J. H. Painter, and J. S. Rose (no. 8401).

**Ionoxalis tenuissima** Rose, N. Amer. Flora **25**[1]: 35. 1907.

Plants 9 to 18 cm. tall, the bulb scales 3-ribbed; leaves about as tall as the scape, the petioles finely pubescent, or glabrate in age; leaflets mostly 8 to 11, the blades narrowly linear, 2.5 to 6 cm. long, obtuse, or slightly notched at the apex, glabrous, light green above, glaucous beneath; scapes glabrous; cymes 2 to 5-flowered; pedicels 1 to 2 cm. long, glabrous; sepals lanceolate, 3 to 4 mm. long, glabrous except the ciliolate margin, acute, each bearing two rather long apical tubercles; petals violet, 10 to 12 mm. long; shorter filaments glabrous; longer filaments pubescent, unappendaged.

Type collected between Dolores and Santa Gertrudis, Tepic, Mexico, August 7, 1897, by J. N. Rose (no. 3423).

**Ionoxalis trientalis** Small, N. Amer. Flora **25**[1]: 35. 1907.

Plants 10 to 15 cm. tall, the bulb scales 3-ribbed; leaves as tall as the scape or nearly so, the petioles glabrous; leaflets 7 to 10, the blades elliptic or elliptic-lanceolate, 3 to 5.5 cm. long, rather obtuse at the apex, narrowed at the base, bright green above, pale green beneath, glabrous; scapes glabrous; cymes 5 to 8-flowered; pedicels 1.5 to 3 cm. long, glabrous; sepals oblong or nearly so, 3 to 4 mm. long, bearded at the apex, each bearing 4 uneven, rather elongate, apical tubercles; petals lilac, 13 to 17 mm. long; shorter and longer filaments pubescent, the latter unappendaged; styles mostly glabrous; capsules columnar, about 1 mm. long, glabrous and glaucous.

Type collected near Colomas, Sinaloa, Mexico, July 19, 1897, by J. N. Rose (no. 3217).

**Ionoxalis trineuris** Small, N. Amer. Flora **25**[1]: 34. 1907.

Plants 5 to 20 cm. tall, the bulb scales 3-ribbed; leaves fully one-half as tall as the scape or equaling it, the petals glabrous; leaflets 4 to 8, the blades 1 to 3 cm. long, cuneate, usually broadly so, notched to above the middle, the lobes ovate or oblong, deep green above, paler beneath, glabrous except sometimes for a few marginal hairs near the apex; scape glabrous; cymes 2 to 7-flowered; pedicels 1 to 2 cm. long, glabrous; sepals oblong to lanceolate, 3.5 to 5.5 mm. long, glabrous, each bearing 2 apical tubercles; petals violet, 12 to 16 mm. long; shorter filaments glabrous; longer filaments pubescent above, each with an appendage on the back near the base.

Type collected on "hacienda de la Encarnacion," State of Mexico, Mexico, July 7, 1905, by J. N. Rose, J. H. Painter, and J. S. Rose (no. 8472).

**Ionoxalis vallicola** Rose, N. Amer. Flora **25**[1]: 39. 1907.

Plants 1 to 3 cm. tall, the bulb scales many-ribbed; leaves as tall as the scape or nearly so, the petioles sparingly pubescent; leaflets 3, the blades obreniform, 2 to

4.5 cm. wide, deep green and glabrous above, slightly paler and with scattered hairs beneath; scapes less pubescent than the petioles; cymes 3 to 9-flowered; pedicels 1 to 1.5 cm. long, glabrous; sepals lanceolate to oblong, 4.5 mm. long, glabrous, each bearing 2 large apical tubercles; petals light blue, 9 to 13 mm. long; shorter filaments glabrous; longer filaments pubescent, each with an appendage on the back near the base.

Type collected at Tlalnepantla, Federal District, Mexico, July 5, 1898, by C. G. Pringle (no. 6895).

## POLYGALACEAE.

### TWO NEW SPECIES AND A NEW NAME IN POLYGALA.

**Polygala conzattii** Rose, sp. nov.

Slender, at least 40 cm. high, doubtless much higher, clothed with short crisp hairs; leaves scattered, shortly oblong, 2 cm. or less long, obtuse, mucronate, narrowed at base into a slender distinct petiole, sparsely pubescent; inflorescence a slender elongate raceme bearing scattered flowers; bracts subtending flowers small, ovate, puberulent on the back, persistent; pedicels 3 to 4 mm. long, in age reflexed; flowers pinkish; sepals glabrous, the upper one persistent; upper petal not crested; fruit orbicular or sometimes broader than long, 3 to 4 mm. broad, retuse, when very young densely pubescent but soon glabrate.

Type U. S. National Herbarium no. 571003, collected by C. Conzatti on Cerro San Antonio, Oaxaca, Mexico, October 28, 1908 (no. 1587).

I would place this species near *P. pavoni* Chodat, but it is not a very close relative.

**Polygala lozani** Rose.

*Polygala calcicola* Rose, Contr. Nat. Herb. **10:** 122. 1906, not Chodat, 1893.

**Polygala minutifolia** Rose, sp. nov.

Stems much branched, diffuse, slender, nearly glabrous; leaves minute and scale-like or wanting; inflorescence a few-flowered raceme; fruiting pedicels about 1 mm. long, slightly pubescent; sepals semipersistent, 2 mm. long, somewhat scarious; petals pale; crown cristate; capsule orbicular or a little longer than broad, 3 mm. long, slightly hairy, especially near the top.

Type U. S. National Herbarium no. 462685, collected by C. G. Pringle on dry limestone cliffs of the Sierra Madre near Monterey, Mexico, July 10, 1907 (no. 13949).

## MALVACEAE.

### ERIOXYLUM, A NEW GENUS.

**Erioxylum** Rose & Standley, gen. nov.

Bractlets 3, minute, persistent, ovate, each bearing a large honey gland at base; calyx small, subtruncate, with 5 minute teeth, within bearing a ring of hairs near the base; petals large, purple; stamen tube elongated, anther-bearing except at the top, here naked and cleft into linear lobes; style elongated, simple, bearing a clavate stigma; capsule ovate to ovate-oblong, somewhat 3-sided, bearing black glands all over its surface, the carpels 3; seeds ascending in the cells, glabrous on the face, with a narrow ridge along the medial line, bearing dense cotton on the back and sides; erect shrub or small tree with strict branches; leaves entire.

This genus is nearest Gossypium and Ingenhouzia. From the former it differs in its glandless leaves and minute involucral bracts and in its seeds. It is much closer to Ingenhouzia but has still smaller bracts, glandless calyx, and entire leaves, and is of very different habit.

Two species are known, both from the west coast of Mexico.

Type species, *Erioxylum aridum* Rose & Standley.

**Erioxylum aridum** Rose & Standley, sp. nov.

Shrub or small tree, 3 to 6 meters high, with slender, upright branches; leaves simple, entire, ovate, rounded or cuneate at base, acute, both surfaces slightly stel-

late, the lower surface bearing yellowish glands; petioles densely stellate-pubescent; flowers and fruit appearing before the leaves, borne on short (3 to 5 mm. long), thick peduncles from near the tips of branches of the previous year; bracts ovate, 2 to 3 mm. long; calyx 5 or 6 mm. long, densely stellate-pubescent as are also the bracts and pedicels; corolla 4 cm. long, deep purple with a large dark, nearly black spot at base; capsule 25 mm. long, purplish, covered with large black glands; seeds 6 to 7 mm. long.

Type U. S. National Herbarium no. 637875, collected by Rose, Standley, and Russell near Culiacan, April 22, 1910 (no. 14999). The same was collected by E. A. Goldman near La Rastra, Sinaloa, March 9, 1899 (no. 267).

This species was common along the Mexican branch of the Southern Pacific Railroad between Mazatlan and Culiacan, Sinaloa. It grows on the dry hills among stunted shrubs and trees.

**Erioxylum palmeri** Rose.

*Cienfugosia palmeri* Rose, Contr. Nat. Herb. **1**: 308. 1895.

Only known from the type collection which came from near Colima, Mexico.

## CACTACEAE.

### A NEW SPECIES OF ARIOCARPUS FROM MEXICO.

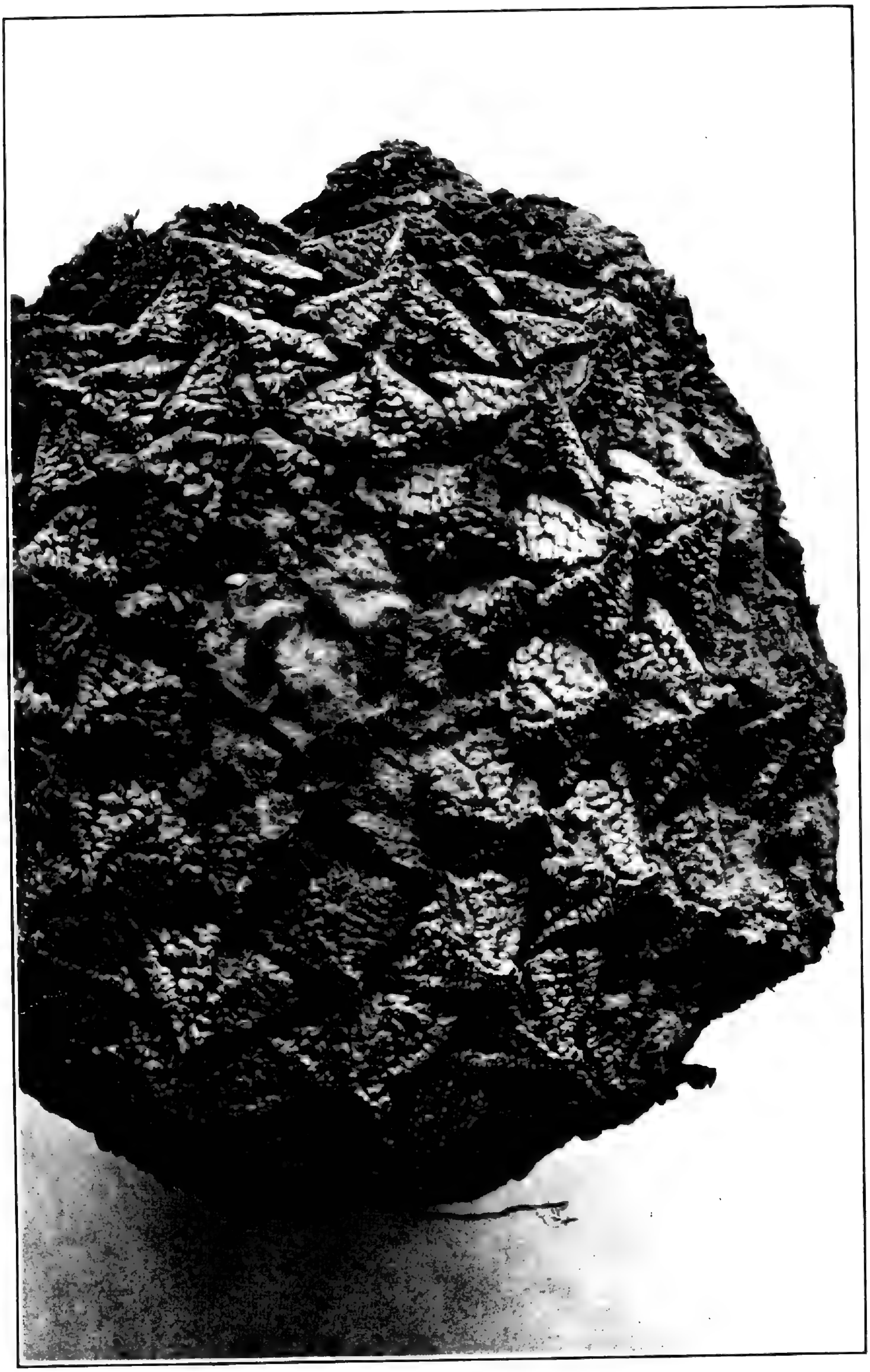
The genus Ariocarpus is generally supposed to contain but five species, although one or two additional ones are sometimes offered by the trade. *Ariocarpus furfuraceus* and *A. retusus* are much alike and are often confused in collections, but as they are very different from the one here described may be passed over for the present. *Ariocarpus kotschubeyanus*, although somewhat similar to *A. fissuratus* in structure, is always small and is of course quite distinct. The new species described below, however, usually passes as *A. fissuratus* and in fact is the only representative of that species in many collections. The true *A. fissuratus* (pl. 62) came from near the mouth of the Pecos River in western Texas, where I obtained some typical specimens in 1908 and whence I afterward obtained an unusually large plant through Mr. M. Dodd, an enthusiastic cactus collector. These specimens are all so similar to Engelmann's illustration of his type and so different from all the Mexican material seen that I have no hesitancy in basing a new species on the material furnished by F. E. Lloyd from the State of Zacatecas, Mexico.

**Ariocarpus lloydii** Rose, sp. nov. PLATE 63.

Plant body low with rounded top, 10 cm. or more in diameter, tapering below into a very thick root; tubercles imbricate, 2 cm. broad at base, the upper portion rounded, obtuse, broader than thick, the whole surface fissured but not in definite bands; areoles filled with a dense mass of hairs; flowers purple, about 3 cm. long; petals broad, apiculate; styles slender, longer than the stamens.

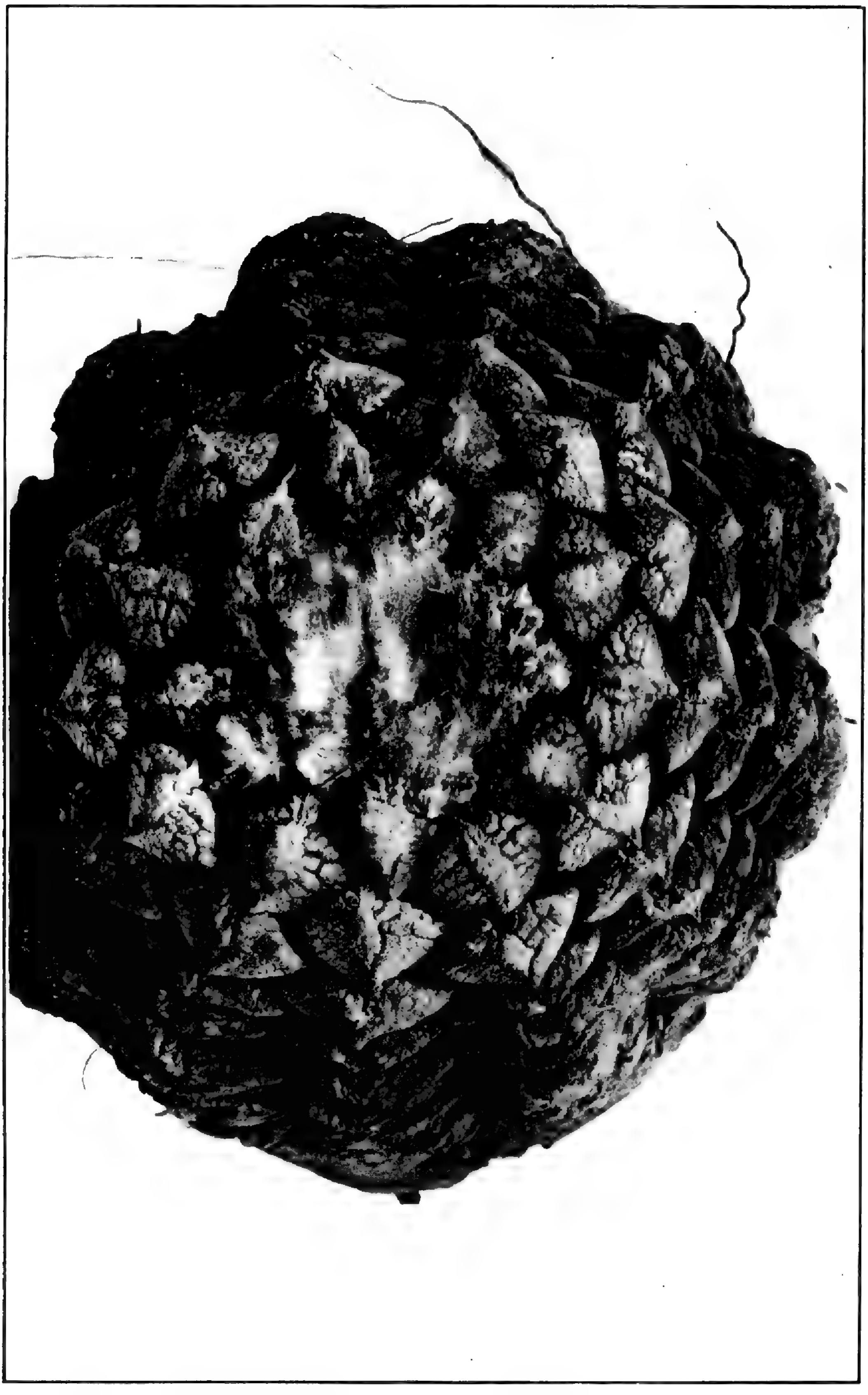
Type U. S. National Herbarium no. 535137, collected by Francis E. Lloyd on the Hacienda de Cedros, Zacatecas, Mexico, 1908 (no. 34). The photograph was taken in Washington.

This species is different from *A. fissuratus* in the shape and surface of the tubercles. In the latter species the corrugations are broken up into bands, the outer ones forming an elevated margin, while in *A. lloydii* they are equally distributed over the surface. Plants of *A. lloydii* are not flat and have a more southern range.



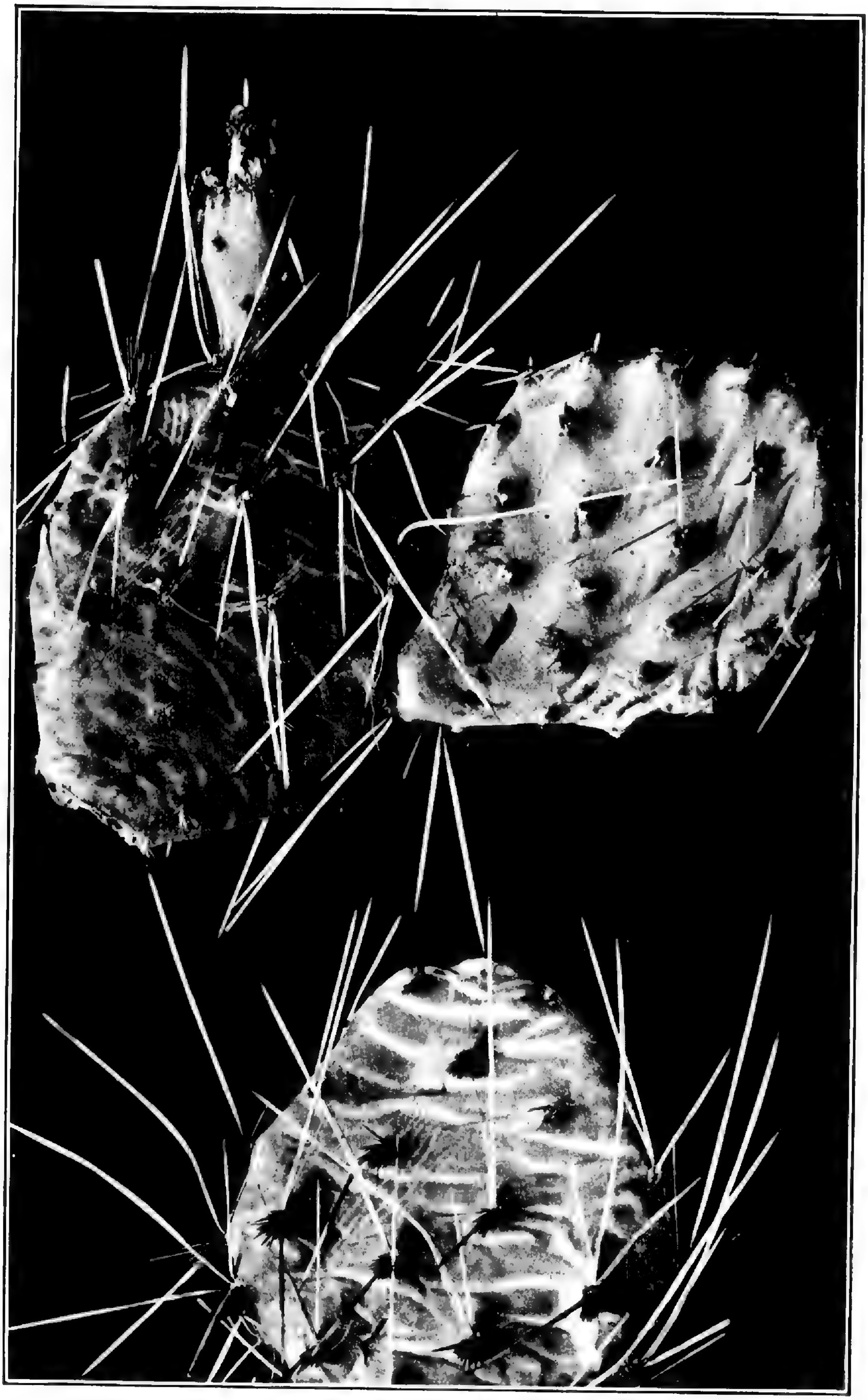
ARIOCARPUS FISSURATUS (ENGELM.) SCHUM.

(Natural size.)



ARIOCARPUS LLOYDII ROSE.

(Natural size.)



OPUNTIA BALLII ROSE.

(Natural size.)



OPUNTIA DEAMII ROSE.

## NOTES AND DESCRIPTIONS OF NORTH AMERICAN SPECIES OF OPUNTIA.

Since the appearance of Britton and Rose's paper entitled A Preliminary Treatment of the Opuntioideae of North America, published in 1908,[a] some 20 additional species, chiefly of Opuntia, have been described. This will require a revision of that paper, material for which is now being brought together. In the meantime it seems best to put forth a few additional species, some of which have been on hand a considerable time, others only recently collected.

**Opuntia ballii** Rose, sp. nov. PLATE 64.

Plant low, spreading; joints obovate, 6 to 7 cm. long, thickish, pale green, spines brownish, a little flattened, usually ascending or erect, the larger ones 4 to 6 cm. long; flowers probably small; fruit about 2 cm. long, clavate in outline, glaucous, spineless.

Type U. S. National Herbarium no. 615400, collected by C. R. Ball at Pecos, Texas, August, 1909 (no. 1506). The photograph was taken in Washington.

Mr. E. O. Wooton tells me that this species is common in the eastern part of New Mexico. I have a specimen of his plant from the top of the Guadalupe Mountains collected August 3, 1909.

Not closely resembling any species known to me.

**Opuntia cyclodes** (Engelm.).

*Opuntia engelmannii cyclodes* Engelm. Proc. Amer. Acad. **3:** 291. 1856.

*Opuntia lindheimeri cyclodes* Coult. Contr. Nat. Herb. **3:** 422. 1896.

Since the publication of the "Preliminary Treatment" I have examined considerable material of *Opuntia engelmannii cyclodes* as well as of *O. engelmannii*, the latter in its type locality, and I am convinced that the variety deserves specific rank.

**Opuntia deamii** Rose, sp. nov. PLATE 65.

One meter or so high, usually with a definite cylindrical trunk, branching a short distance above the base; branches few, ascending, compact; joints erect or spreading, very large, 25 to 30 cm. long, obovate to oblanceolate, rounded at apex, at first bright leaf green, later dark green, glabrous; areoles remote, often 4 cm. apart, rather small for size of joints; spines stout, white or dull yellow, somewhat flattened, 2 to 6, usually 4, spreading or porrect, 3 to 5.5 cm. long; flowers 7 cm. long, reddish; fruit short-oblong, 6 cm. long, naked except a few spines (8 to 12 mm. long) at the tip, wine-red both within and without, disagreeable in taste; seeds small, 3 mm. in diameter.

Type U. S. National Herbarium no. 535893, collected by Charles C. Deam (no. 6228) Fiscal, June 7, 1909. The photograph was taken in the field by Mr. Deam.

Of the same species are William R. Maxon's no. 8303 from near Salama, January 20, 1905, and F. Eichlam's no. 40, also from near Fiscal.

The above description is drawn from Mr. Deam's plant supplemented by a very full description kindly sent me by F. Eichlam, who states that his plant is the same, with which opinion I am in accord.

Mr. Eichlam also states that the plants grow close together forming an almost impenetrable thicket, and that the trunks are generally covered with branches from the ground up and do not usually take the cylindrical form shown in Mr. Deam's photograph because the plants are so frequently broken or cut by the passers-by. In speaking of the distribution Mr. Eichlam states that as soon as the first high road is passed after leaving Guatemala City in the direction of Fiscal the species opens the

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[a] Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, pt. 4.

area of distribution of the xerophilous flora. Large groves exist in the neighborhood of Fiscal, and the line of distribution extends from here to San José de Golfo and to Sanarata.

**Opuntia delicata** Rose, sp. nov.

A small, procumbent plant with rather thin, ovate, bluish, slightly glaucous joints, often only 4 to 9 cm. in diameter; areoles prominent, bearing conspicuous brown spicules; lower areoles spineless, the upper ones bearing one or two slender brownish spines (the longer one 3 to 4 cm. long); flowers yellow, 5 cm. long; fruit oblong, spineless, 2 to 3 cm. long; seeds small, about 4 mm. in diameter, nearly smooth.

Type U. S. National Herbarium no. 454622, collected by J. N. Rose at Calabasa, April 30, 1908 (no. 11951).

Common in southeastern Arizona and observed at Calabasa, Nogales, and Benson. The description is made up from living and herbarium material. The fruit and seeds are described from material collected by J. W. Toumey in the Santa Rita Mountains.

Mr. Toumey refers his material to *O. stenochila*, which it closely resembles in its seeds.

**Opuntia eichlamii** Rose, sp. nov. PLATE 66.

Tree-like shrubs of considerable size, up to 5 and 6 meters in height, growing straight and erect, the old portions of the stem round, covered with gray bark; joints from obovate, 15 by 20 cm., to almost rotund, 25 cm. wide, forming a scanty crown; epidermis smooth, with a dull gloss, dark green; areoles oval, 2 by 3 mm., 3 to 3.5 cm. apart, visibly sunk in a protuberance, this flattened below, 10 mm. long and 6 mm. wide, with brownish wool and very transient fox-red glochids; spines 4 to 6, very unequal, 1 cm. or less long, rose-color when young, in most cases, soon becoming white, exceedingly sharp, spreading asunder, rather inclined to point downward, the lowest even lying close to the joint; leaves on young joints, caducous, cylindrical, gray at the base running into reddish above, with little red tips bent outwards; flowers produced from the edge of the joint, 7.5 cm. long; ovary cylindrical, 3.7 cm. long, 2.5 cm. in diameter, bright leaf-green, thickly covered with tubercles 6 to 7 mm. apart, its areoles with dark brown wool and dark fox-red glochids penicillately disposed; corolla 3.5 cm. long, rotate when in full bloom, beginning with dark reddish brown scales, changing into magnificent brilliant carmine petals, 1.5 cm. wide; stamens 1.5 cm. long, green at the base, rose-colored toward the top; anthers bright yellow, standing in rows of 10 to 12 on the steeply sloping wall of the deeply umbilicate ovary; style 2.5 cm. long, stout in the lower third, ventriculose, dark red, brighter toward the upper part, ending in 8 to 11 bright green, club-like stigmas inclining toward one another; ripe fruit 4 cm. long by 3 cm. thick; strongly tuberculate; pulp red, very watery, and unfit to eat; seeds developed in profusion, of a reddish brown color.

Type U. S. National Herbarium no. 617659, collected in Guatemala in 1910 by F. Eichlam (no. 13).

Mr. Eichlam states that it is not widely distributed, so far as he has been able to learn. He says that, on the high plain of Guatemala, the species is found in a northeasterly direction, in the nearest suburbs of Guatemala City, especially on the old road to Mexico, and that between the city and churchyard it is scattered about in the thickets and grass.

The above description is based upon one furnished by Mr. Eichlam, who also sent three photographs, one of which is here reproduced.

**Opuntia mackensenii** Rose, sp. nov. PLATE 67.

Plants often producing thick, tuberous roots, low (rarely over 30 cm. in height), sometimes 1 to 2 meters broad; stems mostly prostrate, the branches often erect or ascending; joints mostly suborbicular (occasionally broader than long), varying to obovate, 8 to 16 or rarely 20 cm. in diameter, pale and glaucous when young, rather deep green when older; areoles filled with brown bristles and pale wool when young,



OPUNTIA EICHLAMII ROSE.



OPUNTIA MACKENSENII ROSE.

(Scale one half.)

the bristles becoming yellowish in age, the lower areoles naked, the upper bearing 1 to 4 unequal spines; spines brown, white, or brown below and white above, all becoming gray or whitish in age, mostly flattened on one side and twisted, slender, on young joints spreading, on very old ones usually reflexed; flowers medium-sized, yellow, with a 7 or 8-lobed stigma; fruit spineless, oval (or sometimes narrower with or without a contracted base), 4 to 5, rarely 6 cm. long, truncate at apex, rose-purple, with a nearly colorless, pleasant-tasted pulp; seeds suborbicular, 5 to 6 mm. broad, acutish-margined, nearly white.

Type U. S. National Herbarium no. 617434, collected by Bernard Mackensen, near Kerrville, Texas, August, 1909. The photograph was taken in Washington.

The following note by Mr. Mackensen made in the field is of considerable interest:

I now send you two more packages containing more typical specimens of *O. mackensenii*. I am also trying to have a photograph made of a large, typical plant. I have had to revise my ideas of this species somewhat in consequence of the examination of numerous specimens growing under various conditions. I find that many plants are without tubers, and I believe this to be the case especially with those produced by vegetative propagation. On normal plants the fruit is oval and rose-purple; on those suffering from drouth, disease, etc., it is usually narrower and frequently contracted below.

*Opuntia mackensenii* differs from *O. ferruginospina* chiefly in its tuberous roots and procumbent habit, and in the shape and size of its joints, character of its spines, yellow color of its flowers, size, shape, color, and taste of its fruit, and size and color of its seeds. It is evidently more closely related to *O. macrorhiza*, from which it differs chiefly in the size of its joints and the number and character of its spines, in its 7 or 8-lobed stigma, and in the form and color of its fruit.

## APIACEAE.

### A NEW ARRACACIA AND A NEW ERYNGIUM.

**Arracacia compacta** Rose, sp. nov.

Perhaps a meter high; stems purplish, more or less glaucous; basal leaves 35 cm. or more long, ternately compounded; ultimate segments lanceolate, sometimes lobed below, sharply serrate, acute, glabrous above, pubescent beneath; ultimate peduncles rather short, 2 to 4 cm. long; involucral and involucel bractlets wanting; peduncle 1 cm. or less long, pubescent when young; pedicels short, puberulent; flowers apparently purplish; fruit abundant, forming large compact heads hiding the peduncles and pedicels; carpels 12 to 14 mm. long, glabrous, sharply ribbed, with slender style but no stylopodium; ribs nearly equal, broad at base, acute; old tubes one in each interval and one under each rib; seed in cross section showing a deep concave base, the outer margin corrugated.

Type U. S. National Herbarium no. 592478, collected by Dr. C. A. Purpus at an altitude of 2,100 to 2,400 meters on Cerro de Chicamole, Puebla, Mexico, August, 1909 (no. 4110).

I have referred this species tentatively to Arracacia, although it lacks the stylopodium of that genus.

**Eryngium purpusii** Hemsley & Rose, sp. nov.

Perennial; stem rather slender, 60 to 80 cm. long, glabrous, naked below the inflorescence; basal leaves numerous, 20 to 35 cm. long, about 12 mm. broad, with numerous spinescent linear lobes narrower than the breadth of the leaves, often bearing small prickles in the axils of these lobes; inflorescence a terminal umbel somewhat compounded together with several axillary clusters; heads 2 cm. or more long, longer than broad; bracts erect, entire, pungent, 8 to 12 mm. long; bractlets entire, pungent; styles elongated; carpels naked below but bearing a few ovate scales above.

Type U. S. National Herbarium no. 592477, collected by C. A. Purpus on Cerro de Cacalotl, Puebla, Mexico, August, 1909 (no. 4109).

## ERICACEAE.

### A NEW SPECIES OF ARBUTUS.

**Arbutus peninsularis** Rose & Goldman, sp. nov.

Tree 8 to 12 meters high, the branches widely spreading, covered with smooth, deep reddish bark; leaves coriaceous, glabrous and shining above, pubescent or tomentose beneath, especially along basal portion of midrib, broadly ovate to nearly elliptic, green above and below, 75 to 95 mm. long, 4 to 6 cm. wide, on rather thinly pubescent petioles 10 to 16 mm. long; inflorescence a short terminal panicle of closely crowded racemes, the racemes about 3 cm. long; flowers pale yellow or whitish, with rather large calyx lobes.

Allied to *A. macrophylla*, but the leaves with shorter petioles, their blades tapering instead of cordate or subcordate at base and much less profusely pubescent along the under side. This species was listed by Brandegee, in his Flora of the Cape Region, as *A. menziesii*, the well-known madroño of California and perhaps northern Lower California, but it differs conspicuously from *A. menziesii* in having the leaves tomentose and green below, instead of glabrous and glaucous, and in the more crowded inflorescence and larger size of calyx lobes.

Type U. S. National Herbarium no. 565524, collected near La Chuparosa, on the upper slope of the Sierra de la Laguna, southern Lower California, altitude, 1,350 meters, by Nelson and Goldman, January 23, 1906 (no. 7453).

The species is rather abundant and generally distributed along with the oaks in the upper Sonoran zone from about 1,350 meters elevation to the summit of the Sierra de la Laguna. It occurs disconnectedly here on the mountain tops, like numerous other species whose congeners are absent in the wide desert interval to the northward.

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[Synonyms in italic. Pages of principal entries in heavy-faced type.]


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SMITHSONIAN INSTITUTION

UNITED STATES NATIONAL MUSEUM

# CONTRIBUTIONS

FROM THE

# UNITED STATES NATIONAL HERBARIUM

VOLUME 13, PART 10

## MISCELLANEOUS PAPERS

By ALBERT W. C. T. HERRE, WILLIAM H. BROWN,
JOSEPH H. PAINTER, PAUL C. STANDLEY,
EDWARD S. STEELE, and E. A. GOLDMAN

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# PREFACE.

This number of the Contributions is composed of six short papers.

The first paper, entitled The Gyrophoraceae of California, by Dr. Albert W. C. T. Herre, of San José, acting professor of biology in the University of Nevada, is a synoptic treatment of the California members of the group of lichens formerly associated under the name Umbilicaria, but now regarded as of two genera, Gyrophora and Umbilicaria, the latter represented in California by only a single species.

The second paper on The plant life of Ellis, Great, Little, and Long lakes in North Carolina, by William H. Brown of the Bureau of Fisheries, was prepared incidentally to an inquiry into the natural supply of food for fishes in those lakes.

The remaining papers are: A Revision of the Subgenus Cyclobothra of the Genus Calochortus, by the late Joseph H. Painter; A Revision of the Cichoriaceous Genera Krigia, Cynthia, and Cymbia, by Paul C. Standley, assistant curator in the Division of Plants; New or Noteworthy Plants of the Eastern United States, by E. S. Steele, editorial assistant in the Division of Plants; and Two New Shrubs from Lower California, by Paul C. Standley and E. A. Goldman.

FREDERICK V. COVILLE,
*Curator of the United States National Herbarium.*

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# THE GYROPHORACEAE OF CALIFORNIA.

By Albert W. C. T. Herre.

The Gyrophoraceae, an extremely natural group of lichens, include three genera, two of which, Gyrophora and Umbilicaria, are represented in the western part of North America. The family is essentially boreal and alpine.

Seventeen species and five subspecies are reported from North America under the name of Umbilicaria by Tuckerman, in his Synopsis of North American Lichens.[a] Of the entire twenty-two forms he reports but six from California, two species and one subspecies being reported only from Californian or Pacific coast localities.

I am not informed how many species belonging to this family are now known to occur in North America, but the number is probably about twenty-five. According to the observations of Doctor Hasse and myself, ten species are now certainly known from California, while there are three more represented on the Pacific slope in the collections I have examined.

When one considers the great diversity of Californian topography and the consequent climatic diversity, this is a comparatively poor showing. Of course the Umbilicarias characteristic of the Southern Appalachians (*caroliniana*, *pennsylvanica*, etc.), can hardly be expected here. But we may confidently look for the occurrence in California of nearly all the alpine or arctic Gyrophoras reported from other parts of North America, when the higher peaks of the Sierras have been more carefully explored. Accordingly I have included in this paper all the members of this family now known to occur in the western third of the continent.

Several representatives of this group are very striking in appearance, attracting the attention of the general botanist and of the trapper or mountaineer as well as that of the specialist, while their adaptations to great extremes of heat and cold render them of considerable interest to the plant physiologist. While they are of no economic importance in this country, *Gyrophora esculenta* Miyoshi, a Japanese species, is prepared for human food, and in the Arctic regions

[a] Part 1, 1882.

several species, grouped under the general name of *tripe de roche*, have often been the means of saving the lives of explorers and *voyageurs*. The more important of these are *Gyrophora proboscidea*, *G. muhlenbergii*, and *G. vellea*. Like all lichens, however, they contain a bitter principle which may be partially removed by boiling and soaking with alkalies, but even so, if eaten to any great extent they cause serious intestinal disorders.

It is hoped that the present paper will stimulate interest in this remarkable group. In its preparation I have had the use of the collections in the U. S. National Museum, and have also examined several other collections abroad and in this country. The major part of it, however, is based on the Bolander collection now in my possession, the extensive collections of Dr. H. E. Hasse, and the material collected in various parts of Europe and Western America by myself.

## GYROPHORACEAE.

The thallus is foliaceous, one to many-leaved, attached by a central umbilicus. The underside may be naked and smooth or granular, or it may be more or less fibrillose or hirsute. An upper and an under cortex are present. The alga is Pleurococcus. The whole development is markedly xerophytic.

The apothecia are usually scattered over the upper surface, though in a few species they are mostly marginal. They may be innate, sessile, or somewhat elevated, or finally may be more or less proliferous. The proper margin is usually black, rarely inclosing a few gonidia beneath. The disk is seldom smooth, but is generally gyroseplicate. The hypothecium is brownish to black. The asci have from 1 to 8 spores, these colorless or dark, simple, septate, or muriform-multilocular.

About 45 species are at present known in the three genera included in this family.

### KEY TO THE CALIFORNIA GENERA.

Spores simple, small, 8 in number..... 1. GYROPHORA.
Spores muriform-multilocular, 1 or 2..... 2. UMBILICARIA.

## 1. GYROPHORA Ach.

**Gyrophora** Ach. Meth. Lich. 100. 1803.

Characters mostly as above. Asci with 8 spores, these colorless or becoming brown with age, simple (plurilocular in a Peruvian species), ellipsoid or oblong, thin-walled, without gelatinous halo; hypothecium brownish to black.

The first species given by Acharius is *Gyrophora glabra*, first recognized by him as *Lichen glaber*.[a] But earlier and later authors alike refuse to recognize this as a valid species. Acharius gave *polyphylla* as a variety of *glabra*, but all later authors of importance have reversed this and reckon *glabra* as a variety of *polyphylla*. One might, therefore, be justified in calling *polyphylla* the type, but this is open to the objection that this species does not represent the genus as satisfactorily as some other species. The first Linnæan species is *Lichen velleus*.[b] Some would therefore claim *Gyrophora velleus* as the type of the genus, and it is as well entitled to such distinction as is *glabra*.

---

[a] Ach. Vet. Akad. Nya. Handl. **15:** 95. *pl. 2. f. 5.* 1794, following Westr. op. cit. **14:** 48. 1793.

[b] L. Sp. Pl. 1150. 1753, following Dill. Hist. Musc. *pl. 82. f. 5.* 1741.




GYROPHORA POLYPHYLLA (L.) BORR. & TURN. AND G. RUGIFERA (NYL.) TH. FRIES.

KEY TO THE SPECIES.

Polyphyllous (as to American species) and always sterile (within our territory so far as known).
Thallus smooth, black, often polished; lobes often narrowed, with spatulate tips..... 1. *G. polyphylla.*
Upper surface more or less covered by a sooty or chaffy scurf. 2. *G. flocculosa.*
Plants usually one-leaved (seldom many-leaved) and more or less freely fruiting.
Apothecia simple, often elevated, not gyrose-plicate; upper surface more or less ridged and reticulate.
Ridges hoary with hard, white granules; under side of plant smooth, more or less pruinose..... 3. *G. reticulata.*
Ridges coarse, without white granules; plant thickly clad with long hairs beneath, or rarely these few or reduced to mere papillæ..... 4. *G. rugifera.*
Apothecia more or less gyrose-plicate.
Thallus pale, from whitish to mouse color.
Under surface densely black-hirsute; thallus large to very large, ashy white, gray, or mouse color.. 5. *G. vellea.*
Under surface not black-hirsute.
Thallus small, ashy gray or mouse color; beneath grayish or blackish, naked or very rarely with fibrils..... 6. *G. grisea.*
Thallus dirty gray or blackish gray; beneath smooth, naked, buff to dusky brown..... 7. *G. arctica.*
Thallus light brown to chocolate and blackish.
Under surface more or less densely fibrillose.
Fibrils mostly paler than the lacerate under surface; apothecia angulate and stellate, but little convex..... 8. *G. angulata.*
Fibrils black; under surface not lacerate; apothecia becoming very large, prominent, dome-like..... 9. *G. polyrrhiza.*
Under surface not fibrillose.
Upper surface irregularly papulose-wrinkled; under side smooth, often slightly pitted .. 10. *G. hyperborea.*
Upper surface not papulose.
Upper surface covered by intricate, black, indented lines resembling sutures; under surface radiately ridged..... 11. *G. erosa.*
Upper surface without special characters; under surface smooth, granulose..... 12. *G. phaea.*

**1. Gyrophora polyphylla** (L.) Borr. & Turn. Lich. Brit. 214. 1839. PLATE 68, *a*.
*Lichen polyphyllus* L. Sp. Pl. 1150. 1753.
*Umbilicaria polyphylla* Tuck. Syn. N. Amer. Lich. **1:** 85. 1882.
Thallus small to medium size, many-leaved, crinkled, cespitose, the surface smooth, often polished, irregularly much lobed and dissected, the erectish lobules often slender with dilated and rounded tips; margin crenate, dentate, unevenly cut, or erose, sometimes minutely and excessively dissected and crisped; color black or very dark brown; under surface naked, finely granulate, dull black.
Sterile with us and very rare in fruit anywhere; I have never seen specimens with apothecia.

Abundant in the Santa Cruz Peninsula at Devil's Cañon and on Mount San Bruno. Collected also by Doctor Hasse in the Tehachepi Range. I have also examined specimens from Vancouver Island, collected by Macoun. There can be no doubt that this lichen occurs in many localities on the Pacific side of the Sierras.

EXPLANATION OF PLATE 68.—*a*, Three plants of *Gyrophora polyphylla*, showing upper surface, material from the Santa Cruz Peninsula; *b*, under surface, and *c*, upper surface of *G. rugifera*, both from specimen collected by Bolander. All scale 2.

**2. Gyrophora flocculosa** Borr. & Turn. Lich. Brit. 217. 1839.

*Lichen deustus* (?) **L.** Sp. Pl. ed. 2. 1618. 1763.

*Lichen flocculosus* Wulf. in Jacq. Coll. **3:** 99 and *pl. 1. f. 2.* 1789.

*Umbilicaria flocculosa* Tuck. Syn. N. Amer. Lich. **1:** 85. 1882.

Thallus small to medium sized, thin, papery, one-leaved or more or less several-leaved, smooth, slightly pustulate or now wrinkled. Color dull blackish brown, more or less covered with a blackish, chaffy or sooty scurf; beneath naked, smooth, almost or quite concolorous, and more or less pitted or lacunose.

Very rare in fruit; I have never collected any fertile specimens nor have I seen any in the herbaria examined.

Here described from material collected by Macoun at Robson on the Columbia River, British Columbia, and compared with specimens from Sweden and a large series collected by me in the Austrian Alps. No doubt this lichen will be found in the higher mountains of northern California, Oregon, and Washington.

A careful reading of Linnæus's description above cited reveals no character by which the plant he called *deustus* could be recognized; in the absence of further information at this time the name *flocculosa* must be used, though it is probable that an examination of herbarium material would show that *deustus* is entitled to precedence.

**3. Gyrophora reticulata** (Schaer.) Th. Fr. Lich. Scand. **1:** 166. 1871. PLATE 69.

*Gyrophora polymorpha reticulata* Schaer. Naturw. Anz. Schw. Ges. **1:** 7. 1818.

*Umbilicaria anthracina reticulata* Tuck. Syn. N. Amer. Lich. **1:** 84. 1882.

Thallus small to medium sized, one-leaved; lobes few, with crenate, finally irregular margin; upper surface finely rimose and areolate, gray brown to blackish brown, covered with radiate folds and ridges which become reticulate, the ridges, particularly at the center, and sometimes the surface between them, hoary with hard white granules; under surface smooth, without fibrils, clear pale brown to dark brown, more or less pruinose, especially toward the margin; apothecia numerous, small to medium, elevated, circular, with a thick peristent margin, simple (in one specimen also occurring more or less plicate); spores ellipsoid to ovoid, simple, colorless, $\frac{6–8}{11–13}\,\mu$.

Here described from specimens in the U. S. National Herbarium (Willey Herbarium) collected in Oregon by Cusick and in Colorado by the Hayden Survey and by T. S. Brandegee. This species is very common on the rocks about Reno, Nevada, a few miles from the California State line, at an altitude of 1,440 meters and upward. It is common in the Sierra Nevada Mountains about the Truckee River, and is exceedingly abundant on Mount Rose in Nevada, which is the highest peak of the Sierras in the Lake Tahoe district. Here at an altitude of 2,600 meters and on to the summit at 3,600 meters it is the dominant lichen.

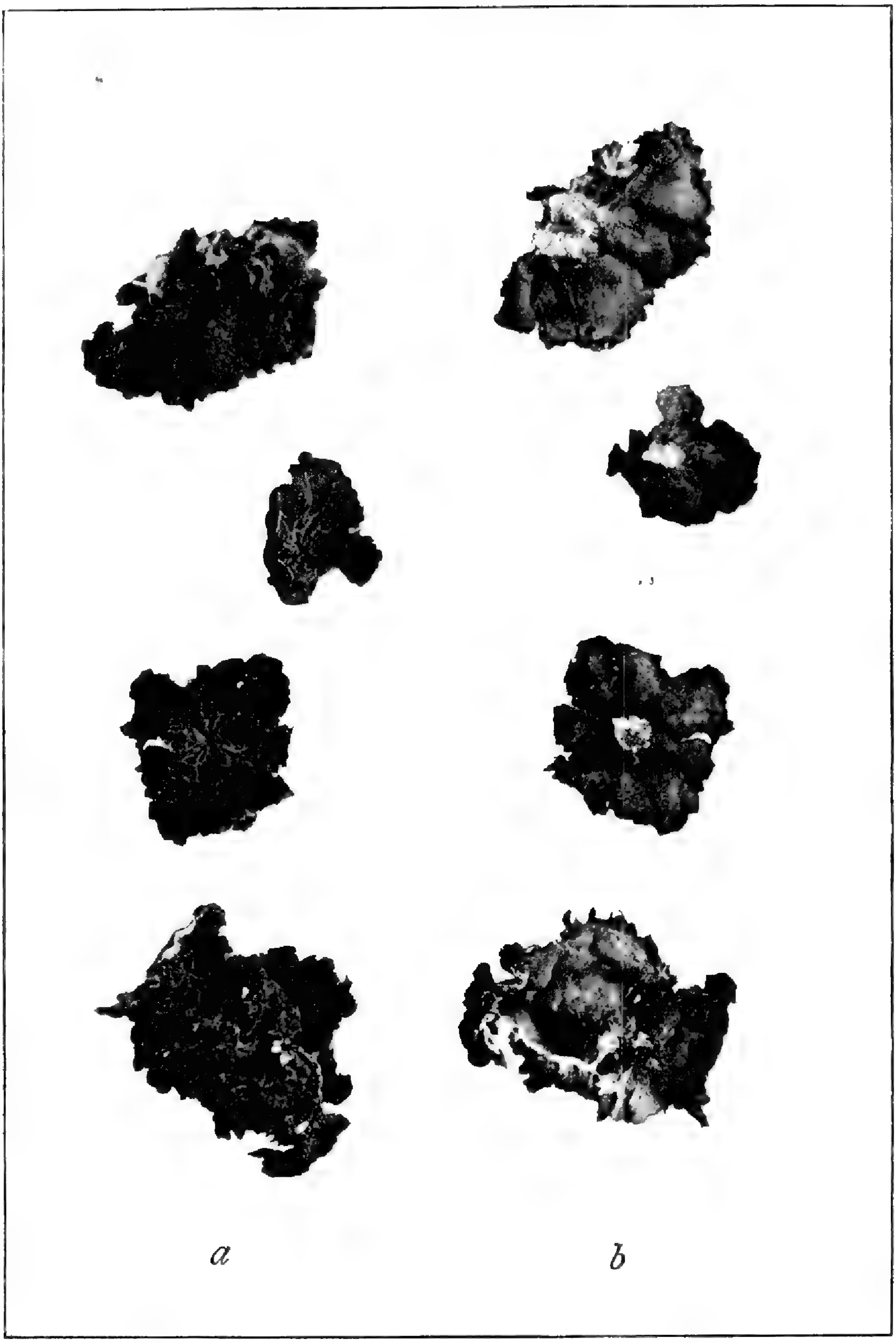
This material from the eastern Sierras is generally much darker in color than that above described, sometimes becoming black.

EXPLANATION OF PLATE 69.—*a*, Upper surface of thallus; *b*, lower surface. Specimens from Reno, Nevada. Scale 2.

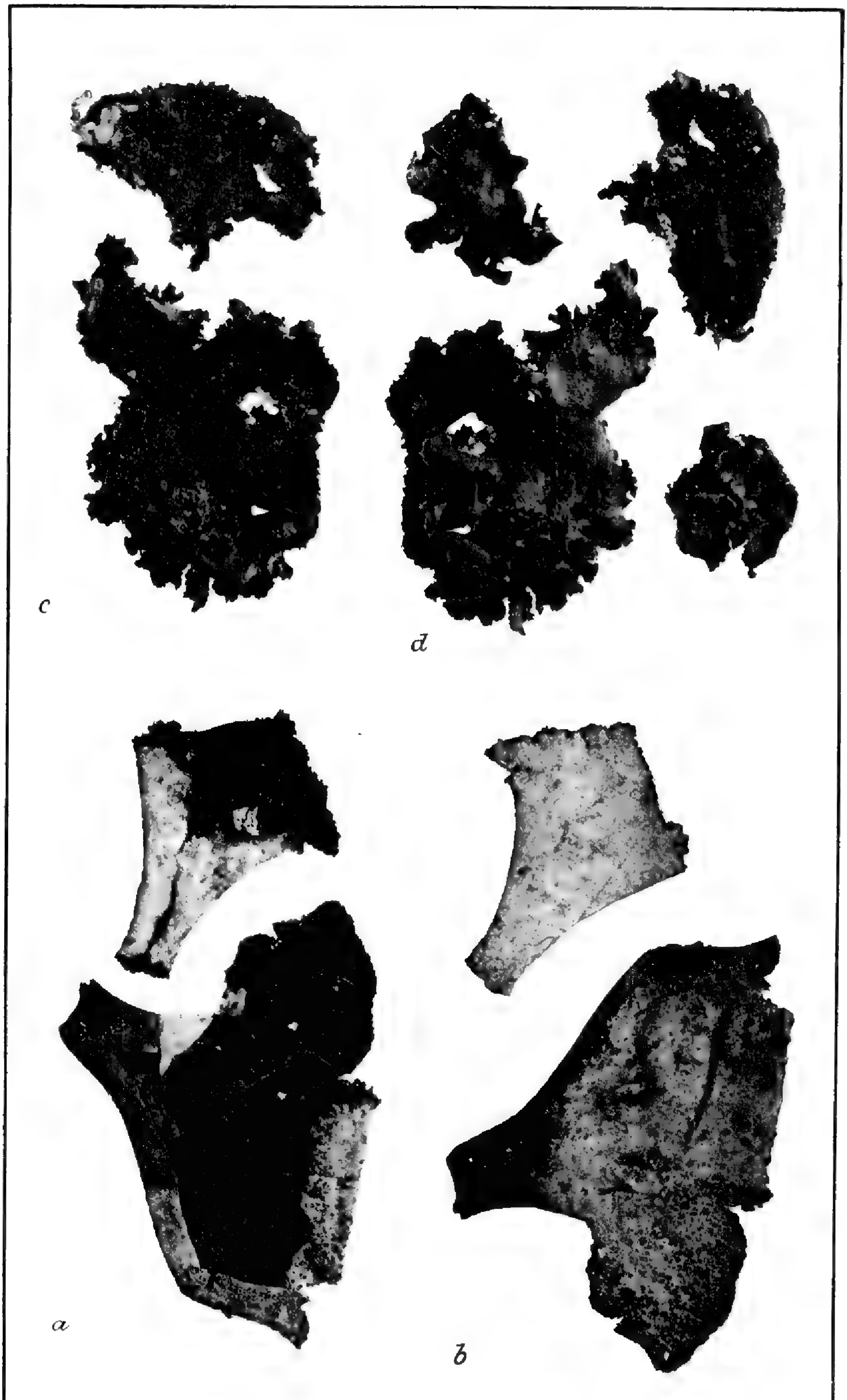
**4. Gyrophora rugifera** (Nyl.) Th. Fries, Lich. Scand. **1:** 156. 1871. PLATE 68, *b*, *c*.

*Umbilicaria rugifera* Nyl. Lich. Scand. 117. 1860.

Thallus varying from medium-sized to rather small (rarely large), one-leaved to complicate-lobed, leathery, rigid, the margin more or less crenate; surface usually




GYROPHORA RETICULATA (SCHAER.) TH. FRIES.




GYROPHORA VELLEA (L.) ACH. AND G. POLYRHIZA KOERB.

more or less roughened and reticulate by coarse, often very high, ridges, rarely papulose with the ridges little evident; color varying from a pale ashen and ashy brown to olive brown or almost blackening above, beneath quite variable, usually a pale pink or roseate, but also buff, ashy brown, and blackening; under surface sometimes smooth with almost no hairs, those present reduced to mere papillæ, but more usually clothed with long simple hairs, these sometimes so numerous as entirely to conceal the surface, and either colorless or varying from pale pink or rose color to blackish; apothecia small to more than medium sized, usually numerous when present, at first adnate but finally prominent or elevated, simple, orbicular, with a narrow entire and finally flexuous margin; asci clavate to ventricose; spores rare, colorless in my specimens, ellipsoid in all Californian specimens, $\frac{4.5–9}{7–15}\mu$; according to Tuckerman the spores also fuscescent; spermatia oblong, 3.5 to 5$\mu$ long.

A plant of alpine peaks and arctic regions, probably occurring all over the western half of the continent; I have examined Californian specimens collected by Bolander and Lapham (no specific locality), and by Doctor Hasse from Mount San Bernardino at an altitude of 3,600 meters, Mount San Antonio at 3,000 meters, and the Tehachepi Mountains at an elevation of 2,500 meters. I have also collected this lichen about Reno, Nevada, at an altitude of 1,600 meters. It is abundant and finely developed, though rarely fruiting, on the summit of Mount Rose above 3,300 meters. It also occurs rather sparingly in the Sierra Nevada Mountains along the Truckee River at an altitude of 2,000 meters. Additional specimens were examined from the U. S. National Herbarium, collected in Colorado, Wyoming, Oregon, Labrador, New Mexico (?), and St. George Island, Bering Sea.

The plant probably occurs on all mountains in the West which rise to a height of 2,000 meters or more.

EXPLANATION OF PLATE 68.—See page 316.

**5. Gyrophora vellea** (L.) Ach. Meth. Lich. 109. 1803. PLATE 70, *a*, *b*.

*Lichen velleus* L. Sp. Pl. ed. 2. 1617. 1763.

*Umbilicaria vellea* Tuck. Syn. N. Amer. Lich. **1:** 87. 1882.

Thallus large to very large, one-leaved, thick, leathery, rigid, the upper surface usually smooth and entire, but sometimes becoming roughened and chinky, varying in color from pale ashy cream to darker, mouse color, yellowish, and brownish, also more or less white or bluish pruinose; under surface black, usually very hirsute, the short fibrils mostly intensely black, sometimes brown, sometimes with naked spots, these when present usually granular; apothecia mostly small to minute, usually near the margin, appressed, plicate, orbicular, more rarely becoming convex and prominent; fertile specimens infrequent. Spores colorless, rounded or short-ellipsoid, $\frac{6–8}{8–15}\mu$.

This lichen has not yet been collected in California, but may be expected in all the Western States. I have examined specimens from the National Herbarium collected in British Columbia, at Columbia Falls, Montana, in Yellowstone Park, and in Colorado. Recorded by Tuckerman from the "North West Coast, *Douglas*," which I interpret as being somewhere between the region of the mouth of the Columbia and Vancouver Island.

EXPLANATION OF PLATE 70.—*a*, Under surface, and *b*, upper surface of *Gyrophora vellea*, same specimen; *c*, under surface, and *d*, upper surface of *G. polyrhiza*. *a*, *b*, From specimen collected by C. F. Baker, in the foothills of the Rocky Mountains, Fort Collins, Colorado, April 5, 1896; *c*, *d*, from material collected at Devils Cañon. All natural size.

**6. Gyrophora grisea** Borr. & Turn. Lich. Brit. 236. 1839.

*Lichen griseus* Swartz; Westr. Vet. Akad. Handl. 52. 1793.

*Umbilicaria hirsuta grisea* Tuck. Syn. N. Amer. Lich. **1:** 87. 1882.

*Gyrophora hirsuta grisea* Hasse, The Bryologist **11:** 56. 1908.

Thallus small, one-leaved, somewhat lobed and crenate, minutely areolate-papillate, ashy gray or mouse colored; under surface finely granulose, scabrous, naked or very sparingly fibrillose, grayish or blackish; apothecia at length convex, immarginate, plicate; spores ellipsoid, colorless, $\frac{8–10}{14–18}\,\mu$.

The above description is compiled, as I have been unable to obtain authentic specimens. Sterile specimens collected in Alpine County, California, by I. A. Lapham, were placed under this species (as a variety of *hirsuta*) by Tuckerman. This species has also been reported by Doctor Hasse from the Tehachepi Mountains, and by Parish from Slover Mountain.

**7. Gyrophora arctica** Ach. Meth. Lich. 106. *pl. 2. f. 6.* 1803.

*Umbilicaria proboscidea arctica* Tuck. Syn. N. Amer. Lich. **1:** 84. 1882.

Thallus from medium size to rather large, one-leaved, thick and rigid, the irregularly crenate and lacerate margin often reflexed; surface varying from granular and nearly smooth to exceedingly rough, pitted and corrugated; color of upper surface in my specimen a dull dirty gray or blackish gray, but in other specimens sometimes a brownish or blackish brown; under surface smooth (in some specimens minutely granular), naked, pale, varying from buff or flesh color and yellowish to dusky brown, and sometimes slightly pruinose; apothecia small, orbicular or sometimes elliptical, exceedingly numerous in my specimen, the thin entire margin soon disappearing and the fruit from flat becoming finally convex and plicate; paraphyses numerous and slender; thecium blue with iodine; spores colorless, often with a slight halo, $\frac{5.75–7.5}{11–15}\,\mu$.

Here described from the only Californian specimen seen, which was collected by Bolander somewhere in the Sierra Nevada Mountains, probably near Yosemite. Specimens were also examined from Greenland, Labrador, and Vancouver Island. This plant should be looked for on all high peaks from Mount Whitney northward. The Vancouver specimens were collected at an altitude of only 1,000 meters but it probably occurs in California only above 2,500 meters.

**8. Gyrophora angulata** (Tuck.) Herre.

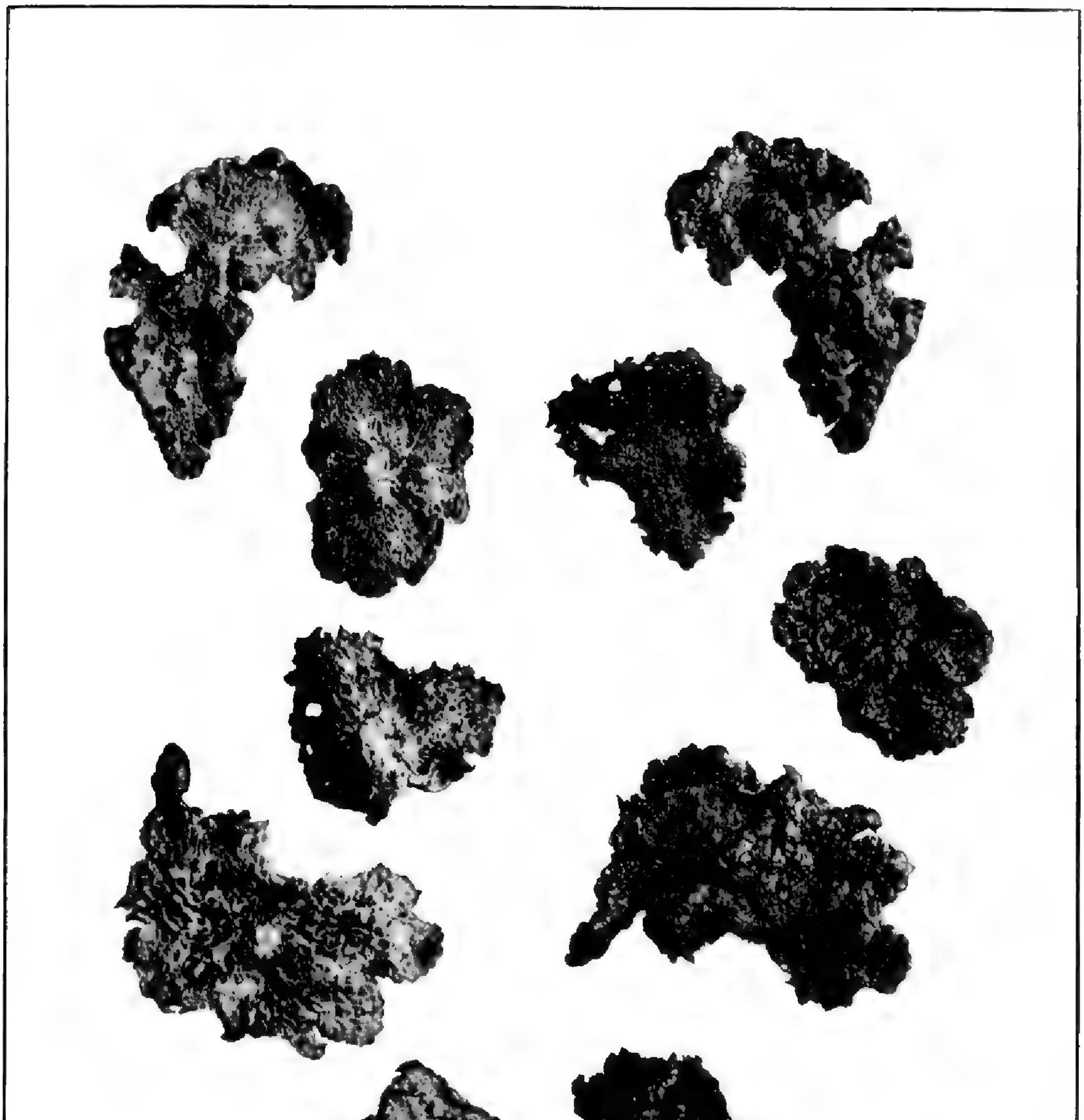
*Umbilicaria angulata* Tuck. Proc. Amer. Acad. **1:** 266. 1847.

Thallus small to medium-sized or occasionally rather large, one-leaved, rigid, the surface usually smooth and somewhat polished, but in some specimens the peripheral portion thickly sprinkled with tiny black lumps; color above ashy brown to tawny and very dark brown, or sometimes a purple brown; under surface black, granulate, lacerate at the center, and finally more or less densely clothed with fibrils, these mostly paler than the surface to which they are attached; apothecia at first small and innate, appressed, angulate and stellate, at length convex and variously shaped, with a thick, persistent margin; paraphyses short, slender, but mostly confluent and degenerate; asci variously shaped, the contents more often not differentiated; thecium greenish and bluish, then wine red or tawny with iodine; spores ellipsoid, colorless, $\frac{5.75–11}{12–23}\,\mu$.

Tuckerman says "fronds (not) surpassing 2 inches in diameter," but a specimen in the National Museum collected by Bolander at Bear Valley has a diameter of 3½ inches. However, it rarely reaches more than half that size.

Specimens have been examined as follows: "California," *Menzies;* Bear Valley, Mariposa County, *Bolander;* Siskiyou County, *C. F. Baker;* Mount San Jacinto, *Dr. H. E. Hasse;* Oregon, from the Willey Herbarium; Vancouver Island, *Macoun.*

Reported by Tuckerman as having been collected by Menzies on maritime rocks at Monterey, but a careful search by me has failed to disclose it anywhere in that region. Collected by Doctor Hasse in the Tehachepi Range and in the mountains about Santa Monica. The plant probably occurs throughout the Sierra Nevada Range and northward to British Columbia. At Devils Cañon, in the Santa Cruz Peninsula, I have found what seems to be a sterile form of *angulata;* otherwise it has not been met with in that part of the State.




GYROPHORA HYPERBOREA (HOFFM.) ACH.

**9. Gyrophora polyrhiza** Koerb. Par. Lich. 41. 1859. PLATE 70, *c. d.*

*Lichen polyrhizos* L. Sp. Pl. ed. 2. 1151. 1763.

*Gyrophora diabolica* A. Zahlbr.; Herre, Proc. Washington Acad. Sci. **7:** 366. 1906.

Thallus small to medium, from one-leaved becoming many leaved and complicate; more or less orbicular, the edges torn or irregular; coriaceous, rigid, usually smooth and polished; color a very dark rich brown, becoming olive when moist, the under surface black, granulate, more or less covered with short, dense, black fibrils.

Fertile plants infrequent; apothecia at first innate and very small, but finally large, rounded or irregularly oblong, prominent and dome-like, reaching a diameter of 8 mm., beautifully gyrose-plicate, black; spores simple, colorless, short-ellipsoid, $\frac{5–7}{7.5–13.5}\mu$.

Abundant in the Santa Cruz Peninsula at Devils Cañon, at an altitude of 600 to 690 meters; it occurs also sparingly at Castle Rock, altitude 900 meters, a few miles southeast of Devils Cañon. The plant is not rare on Mount Hamilton, altitude 1,270 meters, in the Inner Coast Range; according to Doctor Hasse it is abundant in the Yosemite Valley. It probably occurs all over California, wherever the altitude is over 900 meters. A few specimens were sent me from Rhett Lake, Modoc County, by Mr. Harold Hannibal, and I have no doubt it extends into Oregon and Washington.

I have compared my material with authentic fruiting material in the Imperial Museum at Vienna, identified by Dr. Th. M. Fries, and with material in the British Museum and in the Leighton Herbarium at Kew, collected and identified by the same lichenologist.

I do not know what else Miss Cummings may have collected at Wawona, Calif., but the two packets of no. 244, Cummings, Williams & Seymour, Decades of North American Lichens, in my possession, are both *G. polyrhiza*.

This lichen is recorded from northern Europe and Asia, but is not given by Tuckerman in any of his works. It has apparently been overlooked by both collectors and authors in this country till discovered by me in California. In various herbaria I have found a few specimens distributed under the name of *rugifera* or of *muhlenbergii* var. *alpina*, from both of which it is sufficiently distinct.

EXPLANATION OF PLATE 70.—See page 317.

**10. Gyrophora hyperborea** (Hoffm.) Ach. Meth. Lich. 105. 1803. PLATE 71.

*Umbilicaria hyperborea* Hoffm. Deutschl. Fl. 111. 1796.

Thallus medium-sized to small, mostly one-leaved, or sometimes somewhat several-leaved, rather thin and parchment-like, few-lobed, with irregular, sometimes ragged or lacerate margins; surface irregularly papulose-wrinkled, or more rarely nearly smooth, often more or less perforate; color olive brown, chocolate, blackish, and black; the under surface smooth, often slightly pitted, unevenly furrowed, blackish to dark brown or paler, sometimes with a grayish cast; apothecia small, fairly abundant, at first minute and appressed, but eventually elevated, convex and plicate, variously shaped but mostly circular; paraphyses short, slender, tortuous; asci short, oblong to spatulate; thecium bluish greenish, then tawny and wine red with iodine; spores ellipsoid or ovoid, colorless or pale yellowish, $\frac{5.75–7.5}{10–14}\mu$; according to Tuckerman measuring $\frac{6–9}{12–18}\mu$.

Californian specimens have been examined as follows: *Bolander*, exact region not known; *Prof. Clara Cummings*, Truckee; *Harold Hannibal*, Rhett Lake, Modoc County; numerous collections, valley of the Truckee River near the California-Nevada line, altitude 2,000 to 6,200 meters. It is also common about Reno, Nevada, at 1,600 meters and above. It probably occurs generally throughout the mountains about Lake Tahoe and northward. A specimen in the National Herbarium, identified by Tuckerman, was collected in Oregon by *E. Hall*.

Here may be cited also: Cummings, Williams & Seymour, Dec. N. Amer. Lich., no. 156, Mount Lafayette, N. H.; Cummings & Seymour, Dec. N. Amer. Lich., no. 60, Columbia Falls, Montana.

EXPLANATION OF PLATE 71.—*a*, (Left-hand column) under surface of thallus; *b*, (right-hand column) upper surface, same specimens. Material from Reno, Nevada. All scale 2.

**11. Gyrophora erosa** (Weber) Ach. Meth. Lich. 103. 1803.

*Lichen erosus* Weber, Spic. Fl. Goett. 259. 1778.

*Umbilicaria erosa* Tuck. Syn. N. Amer. Lich. **1:** 86. 1882.

Thallus of moderate size, one-leaved, thin, rigid, the lobes few and rounded; margin very irregular, as if torn or gnawed; surface irregularly wrinkled and folded, much dissected by intricate black, indented lines and chinks, which resemble the sutures in a skull, these markings often passing into perforations and crevices cutting entirely through the thallus; color varying from clear clay brown to blackish brown; under side more or less radiately ridged, the ridges often foraminous, becoming ragged or finally passing into laciniate fibrils; usually minutely granulose, smooth, pale brown or blackish; apothecia at first small, innate or plane, variously shaped, with a thin margin; soon prominent, convex, plicate, the margin finally disappearing and the apothecia moderately large; paraphyses short, slender, mostly coherent; thecium greenish blue, soon changing to tawny or red brown with iodine; spores colorless, ellipsoid, $\frac{5–7}{7.3–9}\mu$; according to Tuckerman "fuscescent or decolorate, $\frac{5–7}{9–12}\mu$."

Collected on rocks at Yosemite by Dr. H. E. Hasse, at an altitude of about 1,540 meters, and by me in the Sierras east of Truckee at 2,000 meters. As I have collected it also at Reno, Nevada, we may safely say that it occurs from the Lake Tahoe region northward. Other specimens were examined from Lake Pend d' Oreille, Idaho, where it is said to be abundant on granite ledges, and from Great Slave Lake, British America. I also found it mixed with herbarium specimens of *Gyrophora hyperborea*, from Columbia Falls, Montana.

**12. Gyrophora phaea** (Tuck.) Herre, Proc. Washington Acad. Sci. **7:** 366. 1906.

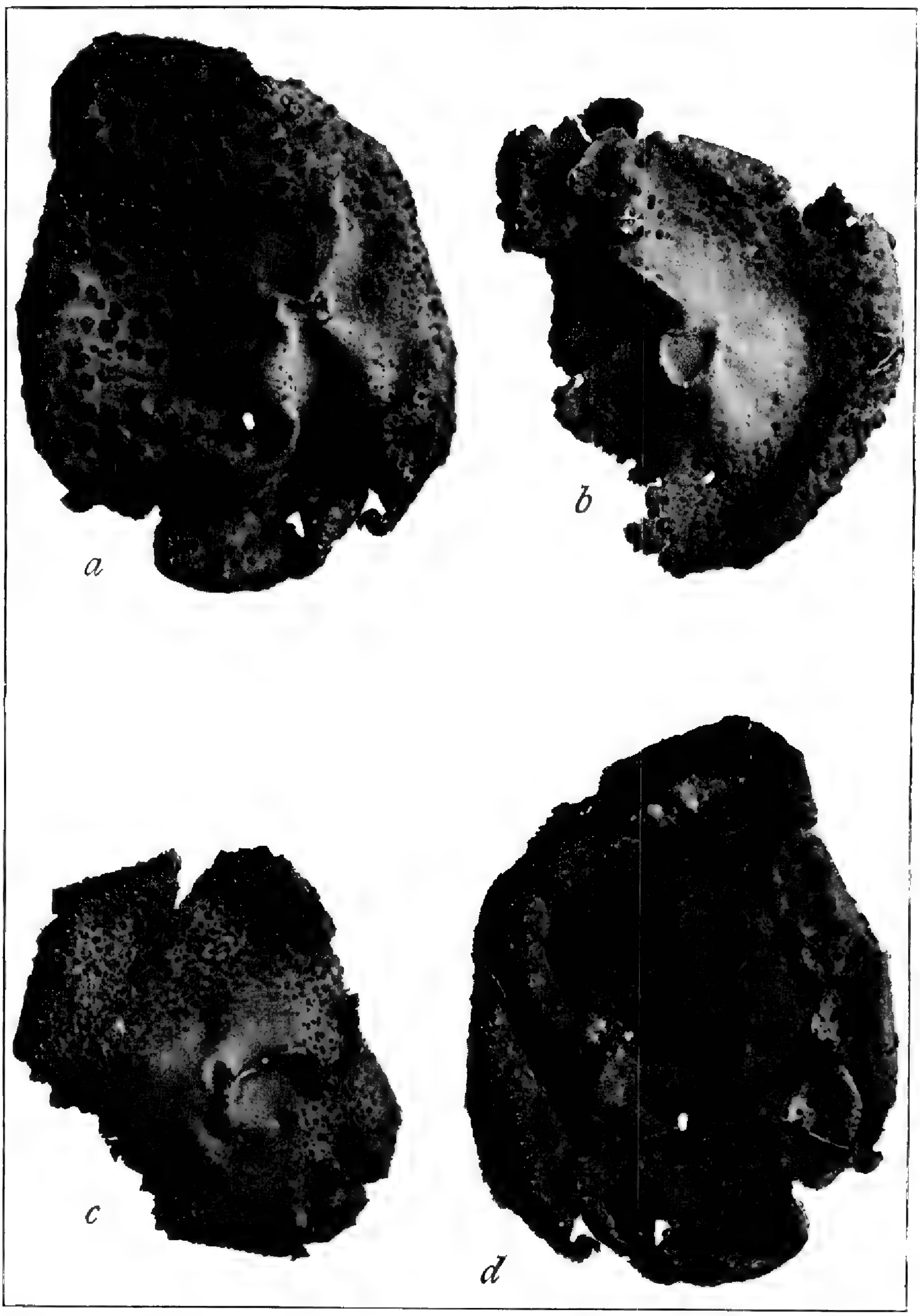
PLATE 72.

*Umbilicaria phaea* Tuck. Lich. Calif. 15. 1866; Syn. N. Amer. Lich. **1:** 86. 1882.

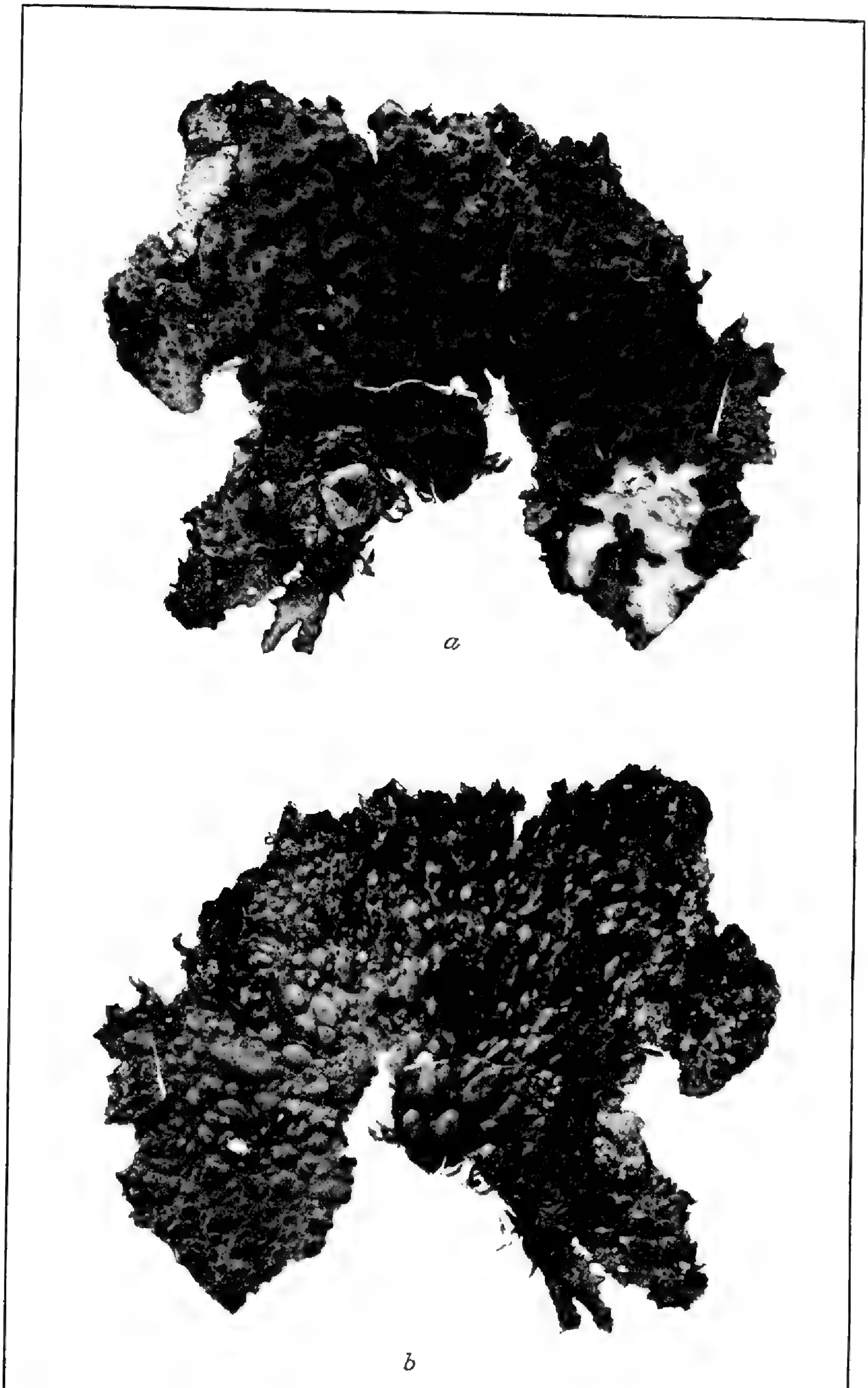
Thallus usually quite small or medium, rarely becoming large, one-leaved (occasionally polyphyllous); upper surface smooth, brown, but varying from greenish or grayish to olive and dark tawny brown; under surface without fibrils and granular, usually darker brown than the upper surface, or even blackish, but sometimes paler, with a pale bloom; apothecia numerous, black; at first innate, but finally prominent, angular or rounded and plicate; thecium brown with iodine, the spores turning a faint greenish yellow; spores simple, colorless to brown, variously arranged in the asci, ellipsoid, $\frac{5–8}{10–13.5}\mu$ and $\frac{8–10}{13–16}\mu$.

The commonest and most characteristic Californian representative of the family. According to Tuckerman found only between 300 and 1,000 meters altitude, but really extending much above and below these limits. In the Santa Cruz Mountains and in Alum Rock Park near San José it occurs at about 90 meters above sea level, while I have collected it in the Sierra Nevada Mountains along the Truckee River and in the desert about Reno, Nevada, at altitudes of from 1,650 meters to 2,000 meters. In the Tehachepi Mountains it occurs at an altitude of 1,700 meters, according to Doctor Hasse.

This is one of the hardiest and most successful xerophytes known. In the deserts of western Nevada where the rainfall is but 8 to 10 inches it grows on the most exposed parts of the south side of bare cliffs and detached bowlders hung high above the soil, where it would seem impossible for any plant to exist. In such places it is usually very small and becomes practically a crustaceous or subcrustaceous lichen which




GYROPHORA PHAEA (TUCK.) HERRE.




UMBILICARIA PUSTULATA (L.) HOFFM.

crowds out all other forms but one, *Acarospora thamnina*, though it is doubtful if any other lichens besides these two could exist on such dry, hot rocks as they monopolize.

In addition to numerous localities in the Santa Cruz Peninsula I have examined material from other Californian localities as follows: Inner Coast Range, Mount Hamilton and Mount Santa Aña; Tuscan Butte, Shasta County; Napa Valley, *J. Torrey*, 1865; Marin County, *Bolander;* Klamath, Siskiyou County; Hood's Peak, Sonoma County; Sims, Shasta County; Mount Diablo; Tehachepi Mountains, *Doctor Hasse;* Vallecito, Lower California; Moreno, Cummings, Williams & Seymour, Dec. N. Amer. Lich. no. 157.

This lichen seems to reach a greater thalline development in the dry inner Coast Range than elsewhere. A specimen in the Tuckerman Herbarium from Mount Diablo has a diameter of 7.5 cm., while I have collected specimens on Mount Santa Aña with a breadth of 10 cm.

This species ranges from Vancouver Island on the north to Guadalupe Island, off Lower California, a specimen from the latter locality being in the Tuckerman Herbarium, and from the western part of Nevada to the Pacific.

EXPLANATION OF PLATE. 72.—*a*, *b*, *c*, Upper surface of thallus; *d*, under surface of plant shown in *a*. Specimens from Mount Santa Aña.. All scale 2.

## 2. UMBILICARIA (Hoffm.) Flot.

*Umbilicaria* Hoffm. Descr. Pl. Crypt. **1:** 7. *pl. 2. f. 1–4.* 1790.

Thallus attached by a central or nearly central umbilicus, without rhizoids. Apothecia usually simple, with smooth disk, in some forms becoming elevated, plicate, and proliferous. Spores rarely more than 1 or 2 in the asci, brown, though often a long time colorless, muriform-multilocular.

The type species is presumably *Umbilicaria pustulata* (L.) Hoffm. (Pl. 73). Species about a half dozen in number, mostly of the temperate zone.

EXPLANATION OF PLATE 73.—*a*, Under surface showing pitted formation; *b*, upper surface. Both natural size.

**1. Umbilicaria semitensis** Tuck. Gen. Lich. 41. 1872.

*Umbilicaria angulata semitensis* Tuck. Syn. N. Amer. Lich. **1:** 88. 1882.

Thallus small to medium (3 to 5 cm. in diameter, Hasse), one-leaved or sometimes several-leaved, rigid, often undulate; upper surface varying from smooth or even polished to finely areolate or sometimes granulose, in color smoky gray, gray brown, and dark brown or chocolate; under surface black or gray black, coarsely granular; radiately ridged, the ridges becoming lacerate and passing into scattered fibrils; apothecia small to medium, innate or appressed, usually crowded toward the circumference, and often confluent, angular, circular, or irregular, plicate, black, with a thick persistent margin; paraphyses slender, free or more often confluent, hardly longer than the clavate or ventricose asci; thecium blue, finally red brown with iodine; spores in Yosemite specimens solitary or in couples, muriform, usually colorless, but at last brown, $\frac{13–15}{19–23.5}$ $\mu$; specimens from the Tehachepi Range yield spores $\frac{16–20}{24–26}$ $\mu$.

In specimens collected by Bolander in 1868, locality unknown, there are, as a rule, one or two spores in the asci, but they also occur in 8's. and measure $\frac{15–20.5}{26–30}$ $\mu$.

This plant has been collected at Yosemite Valley by Bolander, Prof. Clara Cummings, and Doctor Hasse; the latter has also found it in the Tehachepi Range and in the Santa Monica Range. As yet it is not known to occur outside California or north of the latitude of the San Francisco Bay region. Cummings, Williams, & Seymour, Dec. N. Amer. Lich. no. 148, Yosemite Valley, California.

# THE PLANT LIFE OF ELLIS, GREAT, LITTLE, AND LONG LAKES IN NORTH CAROLINA.

By WILLIAM H. BROWN.

## INTRODUCTION.

The study of the flora of Ellis, Great, Little, and Long lakes, North Carolina, was carried on from the United States Fisheries Laboratory at Beaufort, in that State, during the summer of 1908. The field work was done during the months of July and August, and the collections were worked over at the laboratory at Beaufort. My thanks are due to Mr. Henry D. Aller, director of the Fisheries Laboratory at Beaufort, for placing every possible convenience at my disposal, and to Mr. George A. Nicoll and Mr. William Dunn, of Newbern, North Carolina, for the use of their hunting camp, boats, and equipment while doing the field work. I am also indebted to Profs. D. S. Johnson and B. E. Livingston, of the Johns Hopkins University, for valuable suggestions and criticisms.

The four lakes form a compact group situated in the eastern coastal plain of North Carolina, about 10 miles north of Bogue Sound. The region around the lakes is very flat and has a gray, loamy soil. Owing to the flatness of the country the rain water does not run off rapidly but stands on the soil and makes a large part of it swampy. The only cultivated land near any of the lakes is a small patch near but not bordering on Lake Ellis. The rest of it is covered with either forest or low pocosin. The latter is a region kept almost clear of trees by forest fires and covered with an almost impassable growth of small bushes and briars.

The water supply of the lakes is obtained from the rain, either directly or through the neighboring swampy country. The depth of the water in the lakes depends on the amount of rainfall; but as the soil of the surrounding flat country is porous and covered with a dense growth, the water is held back, and there is a more or less constant supply.

The natural outlets can not be seen from the lakes themselves, but are swamps leading to a stream. Canals have been dug from Lake Ellis and Long Lake. All the lakes drain to the Neuse River, but

Great Lake also drains to Oak River. All four are close together, but the only two which are connected are Great and Ellis lakes. These are connected by a swamp through which water flows from Great Lake to Lake Ellis. The water in all the lakes is colored dark by organic matter. Great and Little lakes are about 8 feet deep, while Lake Ellis is generally less than 2 feet deep. The aquatic vegetation is scanty in all except Lake Ellis.

## LAKE ELLIS.

### PHYSICAL CHARACTERS.

Lake Ellis has the general shape of an ellipse and is about 3 miles long by nearly 2¼ wide.

The shore of the lake is covered with trees. The outer part of the water is overgrown with grasses and sedges, while the central part is largely filled with submerged vegetation.

At the time that the lake was examined the average depth of the greater part of it was about 22 inches, and it rarely exceeded 2 feet. Soon after this there were heavy rains for a week. When the lake was visited two days after the rains the water was 4 feet 6 inches deep. The next day it had fallen to 3 feet 4 inches. During the next week it fell only 2 inches more, but after this it fell somewhat more rapidly. Toward the edges of the lake the water gradually becomes shallower, and the bottom grades into the shore.

The only inlet to Lake Ellis is through a swamp which reaches from Great Lake to its western end. It receives, however, a large quantity of water from the surrounding country, which is very flat and in many places swampy. The quantity of water received from Great Lake and from the surrounding country is regulated largely by the amount of rainfall. I am told on reliable authority that there are times when no water runs from Lake Ellis, but these times must be very rare.

The lake is drained by two canals at the eastern end. The water flows into these through the part of the lake covered with grass. There is a considerable current in the canals, but very little in the open part of the lake. The canals empty into Bear Branch, this being tributary to Slocums Creek which, in turn, empties into Neuse River.

The water of the lake has a dark color from organic matter contributed by the plants of the surrounding swamps and of the lake itself.

For a long time there was a canal through the swamp between Lake Ellis and Great Lake, the same running through Lake Ellis and continuous with one of two issuing from the eastern end. The two latter completely drained the lake, and the water in them was utilized to turn a mill. About forty years ago the lake was planted

in rice, but this is said not to have done well. Since that time the canals have filled up considerably, and the lake has been for some years about the same size as at present. From what has been said it will be seen that the growth in the lake is of recent origin.

In summer the temperature of the water rises from about 80° in the morning to anywhere between 90° and 105° about midday. The difference in temperature seems to be largely determined by the degree to which the sun is obscured by clouds.

The soil of the bottom was originally a coarse sand, but the inflow from Great Lake and the interior current have carried humus and small soil particles to certain places and have thus changed its character. The difference in the character of the soil seems to be the chief factor in determining the local character of the flora, as the different zones (to be described later) occur in the same depth of water and have the same amount of light and heat.

## ZONES OF VEGETATION.[a]

The zones depending on the depth of the water, described by Magnin (1893) for the lakes of the Jura and by Pieters (1894) for Lake St. Clair, are not present in this lake, as the water is not as deep as the deeper parts of the phragmitetum or outer part of the littoral zone of Magnin. In Lake Ellis there are, however, three distinct growths, all in the same depth of water, but occuring on different kinds of soil. For convenience these will be called the central, intermediate, and marginal zones. The plants of the marginal zone are emergent forms, chiefly grasses and sedges, while most of the plants of the other two are submerged. Figure 56 represents in a diagrammatic way the distribution of these zones.

The vegetation of the central zone is chiefly composed of *Eriocaulon compressum* either by itself or with Myriophyllum or with *Eleocharis robbinsii*.

The intermediate zone is characterized by *Philotria minor*, Sphagnum, *Eleocharis interstincta*, *E. mutata*, *Panicum hemitomon*, *Nymphaea advena*, *Castalia odorata*, and Hydrocotyle.

The plants of the marginal zone, as has been said, are largely grasses and sedges. The chief species is *Sacciolepis striata*.

To understand the disposition of these zones it is necessary to examine the physical factors which have changed the character of the surface soil in some places from a coarse sand to a fine mud. The water coming through the swamp from Great Lake brings débris,

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[a] The suggestions of the Commission of Phytogeographical Nomenclature of the Brussells Congress were not published at the time this paper was prepared. As no misunderstanding can result from the author's use of the term "zone," it is not thought advisable in his absence to disturb the form of the paper by substituting "girdle" as proposed by the commission.—EDITOR.

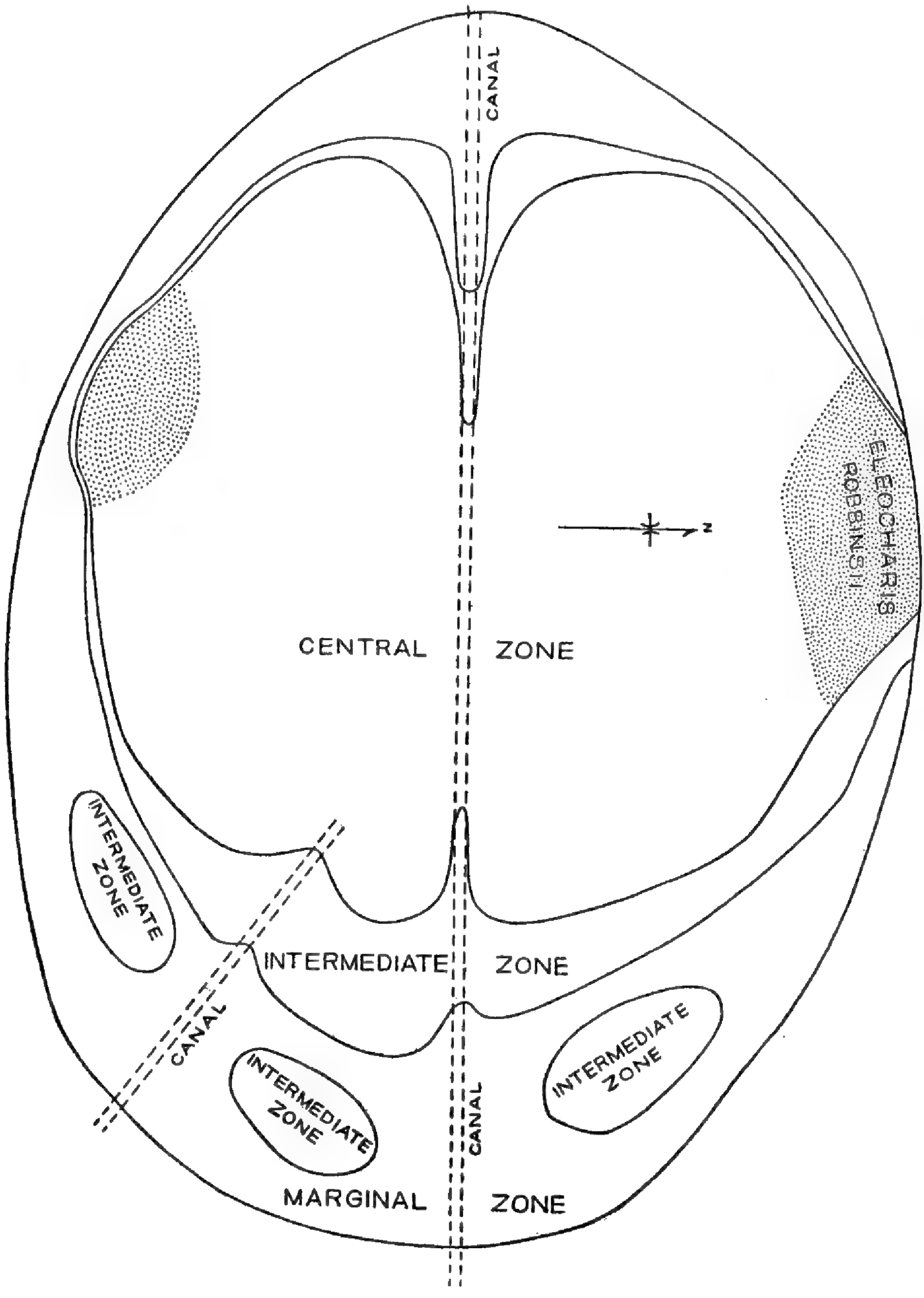



FIG. 56.—Diagram of Lake Ellis.

consisting of soil particles and vegetable matter, mainly the latter, some of which is deposited at the western end and has enriched that part of the lake. Most of the débris, however, comes from the lake itself and a large part of this is carried by the current to the eastern end. Some débris is washed in from the shore at the sides, or blown by the wind from the interior of the lake to the sides, but the character here has not been changed to nearly the same extent that it has at the ends. Where the débris has been deposited the surface soil has been changed to a soft mud. This change is more pronounced at the ends, especially the eastern. From the ends toward the center the change becomes gradually less pronounced, until in the second fifth of the distance from the western to the eastern the soil is left a coarse sand, which is packed by the waves. The canal across the lake has been filled up with humus.

The central zone is confined to the sandiest soil in the lake. The soil becomes muddier toward the outer part of this zone until it passes over into the intermediate zone. The soil here, in turn, gets muddier toward the outside until the intermediate gives way to the marginal zone. The marginal and intermediate zones extend around the central, but are widest at the ends and especially the eastern end.

## MARGINAL ZONE.

The marginal zone is from 1,800 to 2,200 feet wide at the eastern end and about 1,300 feet wide at the western end. At the latter it extends into the lake along the line of the old canal as a narrow tongue for 1,450 feet, and at the former it extends farther along the canals than elsewhere. From the eastern end this zone decreases in width toward the sides until, in the second fifth of the distance from the western to the eastern end, it is about 500 feet wide on the southern side and disappears altogether for a short space on the northern side. Except at the narrowest parts, that is, in the second fifth of the distance from the western to the eastern end, this zone extends far out into the deepest water of the lake while it does not extend into the sand of the second fifth even when this is in shallow water. Between and on the sides of the canals at the eastern end where the soil is removed from the current there are rather sandy patches where the vegetation resembles that of the next zone. The principal growth on these patches is *Eleocharis mutata* and *Castalia odorata*.

The roots of the grasses and sedges of the marginal zone are mostly in the surface mud and large clumps can be readily pulled up. But it is not to be supposed that mud is necessary for the growth of all of these plants, as a large number of them are found on the land around the lakes. Here, however, the soil is a gray loam and much softer and better than the coarse packed sand of the lake.

### INTERMEDIATE ZONE.

The intermediate zone borders on the inner side of the one just described and has the same general shape. At the eastern end of the lake this is 1,650 feet wide and is characterized by a dense growth of *Philotria minor*. Besides this, *Nymphaea advena*, *Pontederia cordata*, Hydrocotyle, and Sagittaria are found in great numbers, and patches of *Panicum hemitomon* and *Eleocharis interstincta* are scattered here and there. Toward the sides of the lake this zone becomes narrower and the soil is in general less muddy, resembling in this respect the inner part of the zone at the eastern end. About halfway up the lake the intermediate zone has narrowed in places to a width of only a few feet. *Panicum hemitomon* and *Eleocharis interstincta* are more prominent, while the growth of *Philotria minor* is much thinner. Most of the other plants disappear to a great extent. In the second fifth of the distance from the western to the eastern end of the lake the intermediate zone becomes irregular. It runs along the marginal zone and also appears as patches of *Panicum hemitomon* and *Eleocharis interstincta* intermingled with the *Eriocaulon compressum* and *Eleocharis robbinsii* of the wings of the central zone. A few scattered plants of Sagittaria are also found here.

At the western end of the lake the intermediate zone is much narrower than at the eastern end and the soil is in general less muddy. Here Sphagnum takes the place of the *Philotria minor* of the eastern end as the predominant plant in the vegetation. This zone extends around the tongue of grass of the marginal zone described above as following the canal. Here *Castalia odorata* is found in great numbers, and it extends out into the canal for some distance after the grass has disappeared. The other most prominent plant of this part of the intermediate zone is *Eleocharis interstincta*. Where this has fenced in small bodies of water, so that the débris from decaying plants has not been washed away, patches of *Castalia odorata* are found. As has been said, the soil is much less muddy at the western than at the eastern end, and this probably accounts for the different character of the vegetation found in the intermediate zone at the two ends.

The vegetation is in general more vigorous toward the outer or muddier edge of this zone than nearer the central zone. The water lilies in the canal grow in very muddy soil and extend far out into the lake. From these facts it seems probable that the soil toward the outer part of this zone does not become unfavorable, but that the plants of the intermediate zone are driven out by those of the marginal.

Since the soil of that part of the eastern end of the intermediate zone which is nearest the marginal zone is muddier than the soil of the intermediate zone at the sides and western end of the lake, it

would seem that the plants of the marginal zone do not occupy the soil at the eastern end as fast as the soil would support them. There seem to be two reasons for this, the presence of competitors to be driven out and the method of invasion by the plants of the marginal zone. Single plants of the grasses and sedges of the marginal zone are rarely found in the intermediate zone, but the plants of the marginal zone seem to advance as a solid stand by means of their rootstocks.

### CENTRAL ZONE.

The central zone is found on the sandiest soil. This is in the central part of the lake and occupies the greater part of it. Two wings also extend far toward the shore in the second fifth of the distance from the western to the eastern end. In this second fifth the soil is very sandy, and in the center, where the water is about 22 inches deep, there is almost nothing but a sparse growth of *Eriocaulon compressum*. Toward the sides where the water becomes shallower, 15 inches or less, there is a growth of *Eleocharis robbinsii*. This rarely extends into water over 15 inches deep and does not grow on soil which would support the plants of either the intermediate or marginal zones. This growth is included in the central zone because of its occurrence with *Eriocaulon compressum* on sandy soil as well as on account of the small size of the plant and its open growth. *Eleocharis robbinsii* extends in for 700 feet on the south side and 1,525 feet on the north side.

Proceeding in either direction from about the middle of the second fifth of the distance from the western to the eastern end, the growth of *Eriocaulon compressum* becomes more abundant and is soon associated with a thick growth of Myriophyllum. This extends to the intermediate zone. In that part of the canal which runs across the lake and is not filled with grass or any of the plants of the intermediate zone the Myriophyllum grows more luxuriantly than elsewhere, showing that the increase in débris is not detrimental to its success and indicating that when this gives way to the plants of the intermediate zone it is because it can not compete with the more vigorous vegetation found there.

### COMPARISON OF ZONES.

The different zones are characterized by different plants, but at the edges of the zones there is often the usual intermingling.

The mass of the vegetation characteristic of the different zones is in proportion to the muddiness of the soil. *Eleocharis robbinsii* and *Eriocaulon compressum* of the central zone are both small plants and do not form dense patches, while Myriophyllum grows in a loose, fluffy mass with little bulk. The plants of the intermediate zone are

much more robust than those of the central zone and form much denser masses, while the grasses and sedges of the marginal zone form a dense mass which extends high up above the water. The difference in the density of the stand of *Panicum hemitomon* and *Eleocharis interstincta* of the intermediate zone and the grasses and sedges of the marginal zone is very noticeable, the latter forming a much denser stand. It seems that the larger growth takes possession of the soil occupied by a smaller one after the soil has become capable of supporting the larger.

That the soil is the factor which determines the distribution is evident after a comparison of the zones. The depth of water, however, influences the distribution of some species in a zone. *Eleocharis robbinsii* of the central zone is rarely found in water over 15 inches deep; but if depth were the only factor we should expect to find the plants of the marginal zone where we find *Eriocaulon compressum* and *Eleocharis robbinsii*. Some of the sedges of the marginal zone are also affected by the depth, but the plants of the marginal zone are just as vigorous in the deepest water of the lake as elsewhere. It is evident, then, that the depth of the water does not determine the disposition of the zones, for where the soil is muddy the marginal zone is in the deepest water, while, where the soil is sandy, the central zone extends into the shallow water.

That light and heat are not important factors in this disposition is shown by the fact that the plants of all the zones are exposed to the direct sunlight, while the current is diffused and not strong enough to affect the heat to any appreciable extent.

That distance from the shore and protection from wind do not play any important part is shown by the projection of the tongue of the marginal zone out into the lake along the canal at the western end, and by the extension of the water lilies along the canal even farther, in separate patches—indeed nearly to the middle of the lake. The marginal zone is 2,200 feet wide at the eastern end, while at the sides it may disappear altogether. Another proof of this is afforded by the patches between the canals at the eastern end, where the soil is removed from the current and is sandy. Here a growth resembling that of the intermediate zone is completely surrounded by the marginal.

Summarizing, briefly, some of the more striking instances which seem to show that the character of the soil determines the zonation are: Between the canals at the eastern end where sandy patches are surrounded by muddy soil the intermediate zone is surrounded by the marginal. At the eastern end where the soil is muddy the marginal zone is 2,200 feet wide and extends far out into the deepest water of the lake, while at the sides where the soil is sandy it may disappear entirely and the central zone occur in the shallow water.

Where the canal has become filled with débris, the marginal and intermediate zones extend as a narrow tongue far out into the lake.

The migration of the plants from one zone into the ground occupied by the next seems to be going on rapidly, but, owing partly to a conflict with the plants present, the invaders probably do not occupy at once all the ground which is capable of supporting them.

The plants themselves are important factors in determining the deposition of débris and the consequent local change in the character of the soil. The plants of the marginal zone decay largely where they fall. The thick stand keeps débris from being washed into this zone and causes it to be deposited on the intermediate zone. The plants of the intermediate zone also catch a good deal of débris. Thus, as the marginal zone advances, new soil is prepared in the intermediate. The plants of the central zone by their decay and by catching débris also cause some change in that part of the lake, and especially near the intermediate zone; but the plants of the central zone, being submerged, must depend largely on that part of the débris which settles to the bottom.

It would seem probable that the marginal zone will finally extend over the whole lake. It also seems probable that by the decay of the plants in this zone the level of the ground will in time be raised sufficiently to support a growth of *Pinus serotina* and *Liquidambar styraciflua*. It is likely, however, that the grasses and sedges will occupy the whole of the lake a long time before the trees make any very great headway.

## ISLANDS AND TREES.

In the water near the marginal or grass zone are a number of small places where the soil comes nearly or quite to the surface of the water. On these spots small trees of *Acer rubrum* are found, and around these is generally a growth of *Panicum hemitomon*, or sometimes *Sacciolepis striata*. A few small specimens of *Acer rubrum* are also found in the marginal zone. Where the canal banks near the edge of the lake are somewhat higher than the surrounding ground, there is found *Acer rubrum*, *Liquidambar styraciflua*, and *Pinus serotina*. A few small specimens of *Taxodium distichum* also occur in the lake. None of these trees are large enough or numerous enough to shade the lake to any appreciable extent except for a short distance along the northern canal at the eastern end. The trees in the lake do not seem to be under favorable conditions.

## BANKS OF THE LAKE.

Small plants of *Pinus serotina* and *Liquidambar styraciflua* are invading the marginal zone where this grades into the shore. The shores of the lake are generally marshy and covered with *Pinus*

*serotina* and *Liquidambar styraciflua.* Sphagnum often covers the ground. The undergrowth varies in different places. The most prominent constituents are small plants of *Pinus serotina* and *Liquidambar styraciflua, Ilex glabra, Drosera longifolia, Limodorum tuberosum, Rhexia mariana, Blephariglottis cristata, Magnolia virginiana, Lycopodium alopecuroides, Lycopodium adpressum, Persea pubescens, Arundinaria tecta, Viola* sp., Xyris, and some of the sedges of the lake. The trees are often festooned with *Dendropogon usneoides* or covered with lichens.

### ALGAL FLORA.

The algal flora of Lake Ellis is rich in number both of species and of individuals. The great mass of plants growing in the lake gives a large surface for attached forms. All of the submerged plants and the stems and the under surface of the floating leaves are covered with these. The filamentous forms growing on these surfaces and the submerged plants themselves form habitats for diatoms and desmids, which occur in great numbers.

The green algæ are present in great abundance, but do not at this season form dense masses and do not seem to be in a vigorous condition. The blue green algæ are even more abundant than the green algae and seem to be in better condition. This seems to agree with the conclusions of Fritsch (1907) that the blue greens are better able to endure a high temperature than the green algæ.

The conditions for algal growth are fairly uniform over the whole lake, and the distribution of the species is fairly general.

Besides the algæ, there are large numbers of bacteria, especially at the surface.

The following is a list of the principal algæ found in Lake Ellis:

*Anabaena flosaquae* (Bg.) Kg.
*Batrachospermum monibiforme* Roth.
*Bulbochaete* sp.
*Chantransia* sp.
*Hapalosiphon brebissonii* Bg.
*Lyngbia* sp.
*Merismopedia glauca* Bg.
*Oedogonium* sp.
*Spirogyra insignis* (Hass.) Kg.
*Spirogyra* sp.
*Ulothrix* sp.
*Zygnema purpureum* Wolle.
*Zygnema* sp.

## GREAT LAKE.

### PHYSICAL CHARACTERS.

Great Lake lies to the west of Lake Ellis. It is kidney-shaped, and about 4½ miles long by 3⅓ wide in the widest part, with an area of about 3,000 acres. In the center of the lake the water is about 8 feet deep.

The lake has no inlet, but the water comes from the surrounding country, which is partly swampy. Owing to the flatness of this country, the porousness of the soil, and the dense growth with which

it is covered, the rain water does not run off rapidly, but furnishes a more or less constant water supply to the lake. There are two outlets, both through swamps. One is at the eastern end and goes to Lake Ellis, while the other is at the northern side and goes to Hunters Creek, which flows into Oak River.

The water is coffee-colored from dissolved and suspended organic matter.

The temperature of the water rises from about 80° F. in the morning to anywhere between 90° and 102° at midday. The difference seems to be largely regulated by the brightness of the sun.

The soil, from the shore to a point where the water has a depth of about 5 feet, is composed of a coarse sand, while in the center of the lake it is a soft mud. This difference seems to be due to the fact that humus and fine soil particles are carried about by the waves until they settle in the deepest part and make that muddy, while the original coarse, sandy soil is left at the edges. There are small patches of peaty soil near the shore in the sandy part of the bottom. These are probably at places where *Taxodium distichum* has grown and then decayed, as these trees grow in this part of the lake and occupy spots of about the same size. The sand is packed hard by the waves and when struck resounds like rock. During storms, however, it is shifted about considerably, as is shown by the fact that a boat which was left anchored in a sheltered bay during four days of stormy weather was, at the end of that time, half full of sand.

The shore line has slight irregularities forming numerous miniature bays. The water is generally about 6 to 12 inches deep at the shore, but the slope of the bottom is quite gradual. The depth of the water at the shore seems to be caused largely by the waves washing up against the shore vegetation.

## AQUATIC VEGETATION.

The aquatic vegetation of Great Lake is very scanty. As in Lake Ellis all of the plants would be included in the phragmitetum or outer part of the littoral zone of Magnin (1893). All of the species in Great Lake are found in the intermediate zone of Lake Ellis.

*Taxodium distichum* is found in the lake near the shore at the eastern end of Great Lake. The reasons for its absence at the western end will be apparent when the vegetation of the shore is discussed. Where the waves wash the bases of these and where stumps or knees come to the surface they are often covered with moss which is partly submerged. The only other vegetation, except algæ, found in the lake consisted of some patches of *Nymphaea advena*, a few patches of *Panicum hemitomon*, and one of *Xyris caroliniana*. These seem to get a start in the peaty places and probably lead a precarious existence owing to the shifting sand, which is likely to bury them or cause their

roots to be exposed. The scarcity of aquatic vegetation is probably due to the packed and shifting sand where the water is shallow and, where it is deeper and the bottom muddy, to the dark color of the water which excludes the sunlight.

## FLORA OF THE BANKS.

The vegetation on the edges of the lake presents quite a different aspect at the western and eastern ends. At the western end there is a low pocosin over which forest fires sweep at frequent intervals. The eastern half is protected by swamps from the fires and the ground is covered with a growth of large trees, consisting largely of *Taxodium distichum, Nyssa biflora, Quercus nigra, Ilex opaca,* and *Liquidambar styraciflua.* The undergrowth is quite dense and is characterized by *Morella cerifera, Leucothoe racemosa, Eupatorium maculatum, Cyrilla racemiflora, Pieris nitida, Ilex cassine, Arundinaria tecta, Magnolia virginiana, Clethra alnifolia,* and *Cornus alternifolia.* Wherever soil has been caught on the stumps or knees of the *Taxodium distichum* growing in the lake this soil supports a growth of some kind, generally *Eupatorium maculatum* or *Clethra alnifolia.* The trees are usually festooned with *Dendropogon usneoides* or sometimes Usnea. *Polypodium polypodioides,* lichens, mosses, and liverworts all grow on the trees in great abundance. Climbing over the trees and shrubs are a large number of vines. The chief species are *Vitis rotundifolia, Smilax laurifolia,* and *Apios apios.* Altogether this part of the shore supports quite a luxuriant vegetation, while all of the western half is covered with low pocosin, which consists of bushes a few feet high and briars.

Scattered through this growth are small pine trees, but the charred remains of those which have been killed by fire are about as numerous as the live ones. The physical conditions, except the humus content of the soil, seem to be the same here as at the eastern end, and it is probable that this part of the shore would be covered with trees but for the forest fires, which kill them and burn the humus out of the soil. These forest fires are frequent in this part of the country. The chief plants found in the low pocosin at the western end are *Persea pubescens, Pieris nitida, Hypericum* sp., and *Smilax laurifolia.*

## ALGAL FLORA.

The algal flora of Great Lake is very scanty. Bacteria are present, however, in great abundance, especially floating at the surface, on the submerged parts of the mosses, and on the trees near the surface of the water.

The most abundant alga is Oedogonium which coats the stems and under surface of the leaves of *Nymphaea advena.* Algæ are also found to some extent on the stems of *Sacciolepis striata* and the

submerged parts of the mosses and trees. The scanty growth on the mosses and trees is associated with the great abundance of bacteria. Aside from the Oedogonium on the leaves of *Nymphaea advena* the green algæ are much less abundant than the blue green algæ. The latter seem to be better able to stand the adverse conditions.

The growth of diatoms and desmids as well as other algæ is scanty. They are found to some extent in the mosses and in the mud at the bottom of the lake, but are very scarce at the surface. This scarcity is associated with the lack of supporting plants, the darkness of the water over the mud, and the presence of bacteria at the surface.

The following is a list of the principal algæ found in Great Lake:

*Anabaena flosaquae* (Bg.) Kg.
*Bulbochaete* sp.
*Chantransia* sp.
*Hapalosiphon brebissonii* Bg.
*Lyngbia* sp.
*Oedogonium* sp.
*Scenedesmus caudatus* Corda.
*Sirosiphon* sp.
*Spirogyra* sp.
*Ulothrix* sp.

## LITTLE LAKE.

Little Lake lies to the north of Lake Ellis and is the smallest of the group. It is nearly round, with a diameter of a little over a mile and a half and an area of about 400 acres. The outlet is through a swamp which extends to Bear Branch, this flowing into Slocums Creek and this, in turn, into Neuse River.

The physical features of Little Lake are like those described as belonging to Great Lake. It has the same kind of bottom and shore and the same character and depth of water. In the center the bottom is muddy, while nearer the shore it is sandy. The water is dark-colored and in the center is about 8 feet deep.

The only vegetation found in the lake consisted of a small clump of *Xyris caroliniana* growing on an old log. The vegetation on the shore resembles very closely that of the shore of Great Lake except that there is here less low pocosin, and *Chamaecyparis thyoides* takes the place of *Taxodium distichum*, which is not found on the shore of Little Lake or in the lake itself.

## LONG LAKE.

Long Lake lies to the northwest of Little Lake. It is a little over 3 miles long and nearly 2 wide in the widest part, with an area of about 1,286 acres.

This lake was visited but not thoroughly examined. The physical conditions and flora seemed to resemble very closely those of Little Lake.

## THEORETICAL DISCUSSION.

### ZONATION.

The relation of soils to aquatic vegetation has been very little studied. It is generally believed that the value of a soil depends largely on its ability to retain moisture. This, however, can hardly be true for submerged soil which is always saturated with water. Pieters (1901), in his work on Lake Erie, has shown that there is probably a relation between the soil and aquatic vegetation. He says that his soil samples were not numerous enough to make general deductions possible, but he indicates the direction in which they seem to point. To quote: "As a rule the soils on which plants occurred in abundance were composed largely of firm sand and contained relatively little silt, fine silt, and clay, while the soils on which few or no plants occurred, although the depth of water and other physical conditions were favorable, were composed largely of silt, fine silt, and clay, and were poor in fine sand and very fine sand." And again: "The water in sandy soils is undoubtedly better aerated than that in clay soils, though both are under water, because in the former case the water passes through the soil more rapidly than it does in the latter, and it would seem that even the roots of aquatics are unable to thrive in a soil so poor in oxygen as the saturated heavy clays." This explanation can not account for the zonation in Lake Ellis, for here we have no clay and the poorest soil is a coarse sand.

Pond (1903) as the result of experiments concluded that Philotria, Myriophyllum, and a number of other plants grew better when rooted in a good soil than when anchored over a soil or rooted in clean washed sand. The writer repeated these experiments with *Philotria canadensis* in the greenhouse of the Johns Hopkins University during the winter and spring of 1910. In these experiments, which will be described more fully in a later paper, as in those performed by Pond, the plants rooted in a good soil grew better than those anchored over the same soil. In the latter case, however, the soil soon became covered by a dense growth of algæ. When the same algæ were transferred to a jar with rooted plants the algæ failed to make any appreciable growth. This suggested that the slight growth of the anchored plants of Philotria was due to the use by the algæ of some substance which came from the soil and which, in the case of the rooted plants, could be used by them, since they were nearer the soil than the anchored ones. Further experiments seemed to show that this substance was $CO_2$, derived from the organic matter in the soil. Plants were grown under a number of different conditions but in no case did they make a normal growth unless some $CO_2$ other than that obtained by the water from the air was supplied them. When a soil which contained little or no organic

matter, even though it were rich in mineral substances, was used the plants made no better growth when rooted than when floating free in the water. This was true both when $CO_2$ was and was not supplied artificially. These experiments seem to show that the $CO_2$ derived from the organic matter of the soil may be an important element in the growth of submerged plants and may be a factor in the distribution of the submerged plants of Lake Ellis. This is, however, probably not the only factor concerned, as this conclusion can hardly apply to the emergent forms and it is probable that the soil factors which determine the distribution of the emergent forms also affect the submerged ones.

Why the nature of the soil should determine the distribution of the emergent plants in Lake Ellis is not clear. When we remember that soils have the property of withdrawing salts from solution and that plants can concentrate salts from very dilute solutions it does not seem probable that anywhere in Lake Ellis there are not enough salts to support the plants of the marginal zone.

The physical nature of the soil, on the other hand, may be a very important factor in determining the zonation. Most of the plants of the two outer zones grow rapidly and have large and rapidly growing roots. The hard-packed condition of the sand would probably offer considerable resistance to the large rhizomes and roots, while the sharp edges of the coarse grains might possibly injure them as they were being pushed through the packed soil. The mud, however, would offer little resistance or injury to the large, soft, and rapidly growing roots and rhizomes.

## PRODUCTION OF PHYTOPLANKTON.

Kofoid (1903) after making careful quantitative determinations of the plankton in a number of lakes concluded that "The amount of plankton produced by bodies of fresh water is, other things being equal, in some inverse ratio proportional to the amount of its gross aquatic vegetation of the submerged sort." He attributes the scarcity of plankton in lakes containing submerged vegetation to a number of causes, but chiefly to the removal from the water, by the larger aquatics, of a great part of the available food material.

Pond (1903), as mentioned above, found that a number of aquatics grew better when rooted in a good soil than when anchored over the same soil. From these and other experiments he concluded that these plants "are dependent upon their rooting in the soil for optimum growth," and that "the roots of these plants are organs of absorption as well as of attachment." He says further that these conclusions are probably applicable to all aquatic plants which grow rooted in a soil substratum.

In a discussion of Pond's experiments by Reighard and Pond (Pond, 1903), these authors conclude that, if Pond's observations are correct, submerged aquatics when rooted not only act as a mechanical support for algæ, but also play an important nutritive rôle by taking mineral food from the soil and organizing it into vegetable matter. "Upon the decay of the vegetable matter this food material is believed to pass into solution in the water. It should there nourish the plankton algæ." Reighard and Pond ascribe Kofoid's results to the fact that the vegetation with which he was dealing was largely Ceratophyllum, and therefore not rooted.

In the experiments mentioned above in which *Philotria canadensis* grew as well when floating free in the water as when rooted in the soil, root hairs were not developed by the floating plants. This suggests that Philotria draws a large part of its nutriment through its leaves and may therefore compete with the plankton algæ for mineral salts, as well as for $CO_2$.

We have already seen that plants of Philotria grow better when some $CO_2$, other than that obtained by the water from the air, is supplied them. The same thing is true of many algæ. A large number of these were tried in different solutions, both with and without the artificial addition of $CO_2$. In every case they made a much better growth when $CO_2$ was added to the solution, and in a number of cases in which they would not grow in a solution without the addition of $CO_2$ they made a vigorous growth when this was added. The need of an abundant supply of $CO_2$, which is shown by both Philotria and many algæ, would suggest that there may be a sharp competition for $CO_2$ between these forms, and that the growth of such plants as Philotria would be detrimental to the production of phytoplankton. In a large number of cases in which various algæ were grown in jars with and without Philotria, it was found that in every case, the algæ grew much better when there was no Philotria present. This was true in all of the solutions tried, both when the Philotria was and was not rooted. It is evident, therefore, that the presence of such a plant as Philotria is in some way harmful to phytoplankton, and since variations in the amount of $CO_2$ control the growth of the plankton algæ to a great extent it is not unlikely that the effect of Philotria on the algæ is due in large part to the use of $CO_2$ by Philotria. It is also probable that the amount of $CO_2$ present in a fresh-water lake will be a more important factor than the amount of mineral matter in determining the quantity of phytoplankton produced.

It has been shown that Great Lake with little submerged vegetation has a very scanty phytoplankton, while Lake Ellis, with a great quantity of submerged vegetation, had an abundant phytoplankton. These results appear at first to be contrary to the conclusions drawn from the experiments; but in Lake Ellis the shallow water, allowing the use of sunlight by the plants, is probably more favorable to both

phanerogams and algæ than is the deeper water of Great Lake. The phanerogams, by giving mechanical support to the algæ, may also place these in a more advantageous position in relation to the sunlight and thus counterbalance to some extent the harmful effect due to their competition.

## SUMMARY.

The whole of the bottom of Lake Ellis is covered with vegetation. There are three distinct zones or successions occurring in the same depth of water, but on different soils. The central zone, found on the sandiest soil, is characterized by *Eriocaulon compressum*, *Eleocharis robbinsii*, and Myriophyllum. The intermediate zone, on muddier soil, is characterized by *Philotria minor*, Sphagnum, *Eleocharis interstincta*, *Panicum hemitomon*, *Nymphaea advena*, and *Castalia odorata*. The marginal zone, found on the muddiest soil, is composed mostly of grasses and sedges, the chief component being *Sacciolepis striata*.

The disposition of the three zones seems to be determined by the character of the soil. The plants of the intermediate zone invade the territory of the central as it becomes muddier by the depositing of débris, while the plants of the marginal zone in turn invade the territory of the intermediate. As this invasion continues the grasses and sedges will occupy more and more of the lake and probably will finally drive out the plants of the other zones. The vegetation in the lake is of recent origin and the invasion seems to be going on rapidly. A few small plants of *Pinus serotina*, *Acer rubrum*, and *Liquidambar styraciflua* are found when the soil comes near the surface of the water.

*Pinus serotina* and *Liquidambar styraciflua* are invading the growth of grasses and sedges from the outer edge.

The emergent vegetation growing in Great Lake consists of *Taxodium distichum*, *Nymphaea advena*, *Panicum hemitomon*, and *Xyris caroliniana*. The aquatic vegetation is very scanty. In the shallow water this is probably due to the hard, shifting sand which forms the bottom, while in the deeper parts of the lake where the bottom is muddy, the dark color of the water probably excludes too much sunlight to allow the growth of plants.

The shore of the eastern half of the lake is covered with large trees under which there is a dense undergrowth. The shore of the western half is covered with low bushes and briers and a few small pine trees. The scarcity of trees here seems to be due to forest fires, which sweep over this part of the shore, whereas the other half is protected by swamps.

The algal flora of Lake Ellis is rich in both species and individuals. The green algæ are abundant but not in good condition in the summer season, while the blue green algæ are more abundant and more vigorous. The blue green seem to endure the high and changeable temperature better then the green algæ.

The algal flora of Great Lake is very scanty and this is associated with an absence of supporting plants, the darkness of the water, and the presence of great quantities of bacteria.

The phanerogams in Lake Ellis compete with the algæ for $CO_2$ and possibly also for mineral matter, and thus probably tend to decrease the amount of phytoplankton, although the mechanical support which they afford the algæ may counterbalance the effect of the competition to some extent.

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## LIST OF PLANTS COLLECTED BY W. H. BROWN IN NORTH CAROLINA.

Of the following list the Juncaceae were determined by Mr. Frederick V. Coville, the Pteridophyta by Mr. William R. Maxon, and the remainder by Mr. Paul C. Standley. The numbers following the names are the collection numbers.

Osmunda regalis L. 33.
Anchistea virginica (L.) Presl. 105.
Lorinseria areolata (L.) Presl. 30.
Polypodium polypodioides (L.) Hitchc. 113.
Lycopodium adpressum (Chapm.) Lloyd & Underw. 14.
Lycopodium alopecuroides L. 41.
Chamaecyparis thyoides (L.) B. S. P. 115.
Pinus serotina Michx. 65, 103.
Taxodium distichum (L.) Rich. 10.
Typha latifolia L. 112.
Sagittaria teres S. Wats. 31.
Philotria minor (Engelm.) Small. 4.
Arundinaria tecta (Walt.) Muhl. 108.
Panicum hemitomon Schult. 42.
Panicum lucidum Ashe. 83.
Panicum scabriusculum Ell. 52.
Sacciolepis striata (L.) Nash. 43.
Carex macrokolea Steud. 17.
Cyperus haspan L. 34.
Dulichium arundinaceum (L.) Britton. 46.
Fuirena hispida Ell. 53.
Eleocharis interstincta (Vahl) Roem. & Schult. 18.
Eleocharis mutata (L.) Roem. & Schult. 74, 75.
Eleocharis prolifera Torr. 63.

Eleocharis quadrangulata (Michx.) Roem. & Schult. 76.
Eleocharis robbinsii Oakes. 26.
Eleocharis tuberculosa (Michx.) Roem. & Schult. 24.
Eriophorum virginicum L. 67.
Rynchospora axillaris (Lam.) Britton. 8, 61.
Rynchospora distans Nutt. 40.
Rynchospora inexpansa (Michx.) Vahl. 11.
Rynchospora macrostachya Torr. 13, 15, 62.
Rynchospora torreyana A. Gray. 39.
Scirpus americanus Vahl. 7.
Scirpus eriophorum Michx. 48.
Scirpus occidentalis (S. Wats.) Chase. 47.
Xyris caroliniana Walt. 1.
Xyris fimbriata Ell. 50.
Eriocaulon compressum Lam. 66.
Eriocaulon decangulare L. 49.
Pontederia cordata L. 70.
Dendropogon usneoides (L.) Raf. 110.
Juncus acuminatus Michx. 45.
Juncus aristulatus Michx. 68, 69.
Juncus canadensis J. Gay. 38.
Juncus effusus L. 9.
Smilax laurifolia L. 54.
Blephariglottis cristata (Michx.) Raf. 16.
Limodorum tuberosum L. 27.
Morella cerifera (L.) Small. 100.
Salix longipes Shuttlew. 20.
Quercus nigra L. 93.
Phoradendron flavescens (Pursh) Nutt. 114.
Persicaria hydropiperoides (Michx.) Small. 44.
Magnolia virginiana L. 78.
Nelumbo lutea (Willd.) Pers. 71, 73.
Castalia odorata (Dryand.) Woodr. & Wood. 6.
Nymphaea advena Ait. 72.
Drosera intermedia Hayne. 22.
Sarracenia purpurea L. 23.
Decumaria barbara L. 97.
Itea virginica L. 59.
Liquidambar styraciflua L. 21.
Rosa carolina L. 109.
Apios apios (L.) MacM. 89.
Polygala cymosa Walt. 3.
Cyrilla racemiflora L. 92.
Ilex glabra L. 55.
Ilex lucida (Ait.) Torr. & Gr. 82.
Ilex opaca Ait. 90.
Acer drummondii Hook. & Arn. 101.
Acer rubrum L. 12.
Vitis rotundifolia Michx. 94, 95.
Ascyrum hypericoides L. 91.
Hypericum maculatum Walt. 81.
Hypericum subpetiolatum Bickn.? 99.
Gordonia lasiantha (L.) Ellis. 56.
Persea borbonia (L.) Spreng. 51.
Persea pubescens (Pursh) Sarg. 2
Rhexia mariana L. 19.
Decodon verticillatus (L.) Ell. 64.
Myriophyllum pinnatum (Walt.) B. S. P. 5.
Nyssa biflora Walt. 57.
Hydrocotyle umbellata L. 28, 35.
Clethra alnifolia L. 77.
Azalea viscosa L. 87.
Chamaedaphne calyculata (L.) Moench. 371.
Leucothoe elongata Small. 102.
Pieris nitida (Bartr.) Benth. & Hook. 88.
Symplocos tinctoria (L.) L'Her. 86.
Utricularia purpurea Walt. 25.
Bignonia crucigera L. 79.
Lonicera japonica Thunb. 98.
Viburnum nudum L. 36.
Eupatorium hyssopifolium L. 107.
Eupatorium maculatum L. 96.
Pluchea foetida (L.) B. S. P. 58.

# A REVISION OF THE SUBGENUS CYCLOBOTHRA OF THE GENUS CALOCHORTUS.

By Joseph H. Painter.

During a trip to Mexico in 1905, as assistant to Dr. J. N. Rose of the National Herbarium, I became much interested in the yellow-flowered species of Calochortus which occur throughout the plateau region. An especial effort was made to collect all forms, each from as many localities as possible, and also to send to Washington the living bulbs, a few of which have since flowered. There have been brought together with this material the collections of Dr. C. G. Pringle, Dr. E. Palmer, Dr. C. A. Purpus, and others, and these all together form a satisfactory basis for a review of the subgenus Cyclobothra to which these plants belong.

The history of the discoveries of the several species begins with Humboldt, who collected two upon the table-lands of central Mexico, and described them, in 1815, as belonging to the genus Fritillaria. Sweet, however, in 1828, having had flowers from bulbs that had been sent from the same region, removed the *Fritillaria barbata* H. B. K. and erected for it a new genus to which he gave the name Cyclobothra; but Schultes, in a monograph of the family two years later, refused to accept this segregate as distinct from the Calochortus of Pursh, to which he referred the two Humboldtian species, changing the specific name in each case. He furthermore described two other species, *Calochortus fuscus* and *Calochortus pallidus*. The following year Sweet transferred *Fritillaria purpurea* H. B. K. to Cyclobothra but ignored the two recent species published by Schultes, possibly because of lack of material. Lindley, however, three years later included all in Cyclobothra and added another to the growing list. Next, Hartweg, collected the most beautiful, as well as the largest-flowered species growing in Mexico, which was named in his honor by Bentham in 1840. Two years later Martens and Galeotti described *Cyclobothra grandiflora* from Michoacan. In 1847 S. Schauer published *Cyclobothra propinqua*, but with no definite locality; and I have been unable to recognize it as distinct from *Calochortus purpureus*.

Baker in his monograph of the Tulipeae (1875) published no new species but took up the specific name given by Humboldt for the

plant long known as *Calochortus bonplandianus*, calling it *Calochortus purpureus*, at the same time allowing the other of the two earliest, *Fritillaria barbata*, still to pass under the substitute name *Calochortus flavus*. Sereno Watson, four years later, described a yellow-flowered form from Oaxaca, dedicating it to the collector, Doctor Ghiesbreght, and in the same paper a second species, *Calochortus spatulatus*. The first of these is the southernmost species of the genus; the second I take to be nearly allied to the problematical *Calochortus fuscus* Schultes, which, however, I am not able to associate positively with *C. spatulatus* and have preferred to place as a *species inquirenda*.

Exploration of the Mexican flora by Americans led to the publication in the same year by both Dr. E. L. Greene and Doctor Watson of a form from northern Mexico. Under *Calochortus venustulus* Doctor Greene published, in January, 1888, the diagnosis of a plant collected in Durango; and in May Doctor Watson published *Calochortus madrensis* based upon specimens collected in Chihuahua. Doctor Greene recognized the species of Watson to be his, and in November of that year, having come into possession of better material, he added to his previous description. A later species, one noted for the extremely dark color of the flowers, has been dedicated by Dr. B. L. Robinson to the veteran collector of Mexican plants, Dr. C. G. Pringle.

Of the two new species proposed here the first, *Calochortus exilis*, is a small plant from Hidalgo distributed by Doctor Pringle as *Calochortus ghiesbreghtianus* (a slip for *ghiesbreghtii*) to which it is closely related. I have taken the name from specimens collected by Ehrenberg and sent to the Gray Herbarium as "*Cyclobothra exilis* Kl." The other new one proposed is from the type locality of *Calochortus pringlei* and, like that species, is dark purple in color, but the flowers differ widely and the nodding habit separates it from all other purple forms. Of this unique species I have seen but one sheet, that in the Gray Herbarium, and Doctor Pringle knows of no other.

Species of other subgenera have been reported from northern Mexico and Lower California. Mr. T. S. Brandegee in 1889[a] reported two species which he called "*Calochortus luteus* Dougl. and *C. splendens* Dougl.," the former from Las Huevitas, the latter from San Pablo. I am told by him that these specimens are not in his collection but had perhaps found their way into that of the California Academy. He adds: "At least one of them is incorrectly named." Miss Eastwood, however, had two sheets from the peninsula, one from Ensanada, collected by Mr. F. E. Barkelew, and one from Valle-deros Creek, San Pablo, collected by Mr. Brandegee, and also one from the Coronados Islands, collected by Dr. E. L. Greene, all bearing

[a] Proc. Calif. Acad. II. 2: 209. 1889.

the name *C. splendens* Dougl. *Calochortus weedii* Wood and *C. albus* Dougl. may be found in northern Lower California, for they have been collected by both Mr. Brandegee and Mr. Le Roy Abrams close to the border line.

In the preparation of this paper I am especially indebted to Dr. B. L. Robinson, curator of the Gray Herbarium, for the loan of the specimens in his charge, among them many types of Doctor Watson, and to Dr. J. N. Rose, Dr. E. L. Greene, and Mr. Wm. R. Maxon for many valuable suggestions as the work progressed.

### KEY TO THE SPECIES.

| | |
|---|---|
| Flowers erect. | |
| Petals yellowish or with a lilac tinge. | |
| Sepals (and petals) yellow. North Mexican.. | 1. *C. venustulus.* |
| Sepals lilac or purplish. Central or South Mexican. | |
| Plant 30 cm. or more high, capsule one-sixth as broad as long..... | 2. *C. ghiesbreghtii.* |
| Plant under 25 cm. high, capsule one-third as broad as long..... | 3. *C. exilis.* |
| Petals (and sepals) dark brown or almost black.... | 4. *C. pringlei.* |
| Flowers horizontal or nodding at anthesis. | |
| Cauline leaves dilated at base. | |
| Inner surface of petals perfectly glabrous..... | 5. *C. grandiflorus.* |
| Inner surface of petals more or less covered with hairs. | |
| Hairs restricted to midvein and to margin. | 6. *C. hartwegi.* |
| Hairs not restricted to midvein and to margin. | |
| Flowers nodding at anthesis..... | 7. *C. cernuus.* |
| Flowers horizontal at anthesis. | |
| Anthers under 0.25 cm. long..... | 8. *C. spatulatus.* |
| Anthers over 0.4 cm. long..... | 9. *C. purpureus.* |
| Cauline leaves not dilated at the base. | |
| Petals oval to rhombic, generally yellow throughout..... | 10. *C. barbatus.* |
| Petals oblong, acuminate, purplish at base.... | 11. *C. barbatus chihuahuanus.* |

## 1. CALOCHORTUS VENUSTULUS Greene.

*Calochortus venustulus* Greene, Pittonia **1**: 158. January, 1888. "On the higher Sierra Madre back of the city of Durango, Mexico, altitude 8,100 feet, A. Forrer, autumn of 1881."

*Calochortus madrensis* S. Wats. Proc. Amer. Acad. **23:** 283. May, 1888. "On pine plains at the base of the Sierra Madre, Chihuahua, C. G. Pringle (n. 1382), September, 1887."

Stem 10 to 30 cm. high, branching, from a fibrous-coated corm 1 cm. in diameter; leaves all linear, the basal broader, generally single; flowers erect, yellowish, on slender peduncles about equaling the leaves; sepals oblong, obtuse, mucronulate, 1.2 to 2 cm. long; petals equaling the sepals, cuneate-obovate, naked above but hairy below and of the same color; gland obscure or obsolete; anthers 2 to 3 mm. long.

DISTRIBUTION: In the Sierra Madre of Chihuahua and Durango.

*Specimens examined:*

DURANGO: Sierra Madre, west of Durango, altitude 2,300 meters, September–October, 1881, *A. Forrer;* Sierra Madre, 15 miles north of Guanacevi, 2,100 to 2,300 meters, August 17, 1898, *E. W. Nelson,* 4761.

CHIHUAHUA: Base of the Sierra Madre, pine barrens, September 17, 20, 1887, *C. G. Pringle,* 1382; in the Sierra Madre near Colonia Garcia, July 20, 1899, *C. H. T. Townsend & C. M. Barber,* 155.

LOCALITY UNKNOWN: Cultivated from Pringle's bulbs at the Botanical Garden, Harvard University, August, 1888. (Origin not otherwise stated.)

### 2. CALOCHORTUS GHIESBREGHTII S. Wats.

*Calochortus ghiesbreghtii* S. Wats. Proc. Amer. Acad. **14:** 268. 1879. "Chiapas, Ghiesbreght (Nos. 104, 661)."

Stem branching up to 40 cm. high; corm unknown; lower leaves narrowly linear, the upper linear-lanceolate graduating into lanceolate bracts; flowers one to several, erect on slender peduncles exceeding the leaves; sepals (of dried specimens) lilac, shading to lemon yellow on the margins, oblong, obtuse or slightly acute at apex, about 1.5 cm. long; petals tinged with lilac at base, cuneate-obovate, obtuse, hairy and with a distinct hairy gland below the middle, anthers 0.3 cm. long, shorter than the slender filaments, "capsule 1½ to 2 inches long." (S. Wats. loc. cit.; fruit lost from the specimens quoted by him.)

DISTRIBUTION: Chiapas. The southernmost species.

*Specimens examined:*

CHIAPAS: Without more specific locality, *Ghiesbreght* 661. "Terre froide. Fleurs jaunes pales. Fleuris in Août et Septembre. Croit sur les rochers;" also *Ghiesbreght* 104. Both in the Gray Herbarium, marked "n. sp."

### 3. CALOCHORTUS EXILIS Painter, sp. nov.

Stem simple or with a few branches, 8 to 15 cm. high from a fibrous-coated corm about 1 cm. in diameter; leaves narrowly linear, mainly basal; bracts lanceolate; flowers 1 or 2, erect, on slender peduncles shorter than the leaves; sepals purple to purplish or even yellowish, 1 cm. long, oblong, obtuse or sometimes mucronulate; petals lemon yellow, obovate, cuneate, obtuse; anthers 1.5 mm. long, shorter than the filaments; ovary ovate-lanceolate in outline; capsule unknown.

Type in the U. S. National Herbarium, no. 354467, collected on bare summits of the Sierra de Pachuca, altitude 3,000 meters, September 14, 1899, by C. G. Pringle (no. 8247).

DISTRIBUTION: In the mountains of Hidalgo.

*Specimens examined:*

HIDALGO: Cerro de los Navajos, Mineral del Monte, November, 1835, *C. Ehrenberg* 501; bare summits, Sierra de Pachuca, type collection.

### 4. CALOCHORTUS PRINGLEI Robinson.

*Calochortus pringlei* Robinson, Proc. Amer. Acad. **36:** 472. 1901. "Collected by C. G. Pringle in thin soil on the top of the knobs of the Sierra de Tepoxtlan, State of Morelos, Mexico, altitude 2,300 meters, 15 September, 1900, no. 8435. Type in herb. Gray."

Stem simple or branched, somewhat flexuous, 30 to 50 cm. high from an ovoid fibrous-coated corm, surmounted by a mass of long, linear, dark brown scales; leaves linear, the basal 20 to 40 cm. long, cauline gradually smaller; bracts lanceolate, acuminate; flowers dark purple or almost black, erect, on slender pedicels exceeding the leaves; sepals "narrowly obovate, bluntly pointed or retuse, glabrous except at a small roundish area below the middle on the inner surface;" petals narrowly obovate,

cuneate, about 1.5 cm. long, externally glabrous, internally covered on all parts except the narrowed base by rather coarse violet or yellow hairs; ovary glabrous; capsule elliptic in outline, acute at both ends.

DISTRIBUTION: Morelos. Only known from type locality.

*Specimens examined:*

MORELOS: Sierra de Tepoxtlan (see above). Type in the Gray Herbarium and cotypes in the U. S. National Herbarium and the Philadelphia Academy of Natural Sciences.

### 5. CALOCHORTUS GRANDIFLORUS (Mart. & Gal.).

*Cyclobothra grandiflora* Mart. & Gal. Bull. Acad. Sci. Brux. 9²: 384. 1842. "Border of Lake Patzcuaro, 7,000 feet, H. Gal. no. 5313."

Stem simple, 50 cm. high; basal leaves narrowly linear, the cauline broadly linear to lanceolate, clasping and dilated at base; axils bulbiferous; flowers few on stout peduncles, but little exceeding the leaves; sepals oblong, acute, yellowish, with an oval, slightly hairy gland near the base, 3.5 cm. long; petals larger, broadly elliptic, obtuse, ciliate, deeper colored and with a triangular gland near the base; anthers 5 mm. long.

DISTRIBUTION: In the Sierra Madre of Jalisco and Michoacan.

*Specimens examined:*

JALISCO: Barranca near Guadalajara, June, 1886, *Dr. E. Palmer* 580; vicinity of Rio Blanco, near Guadalajara, September 30, 1903, *J. N. Rose & Jos. H. Painter* 7445.

Bulbs of the last-cited collection flowered in Washington, May, 1905.

### 6. CALOCHORTUS HARTWEGI Bentham.

*Calochortus hartwegi* Benth. Pl. Hartw. 26. 1840. "In pascuis montium prope Aguas Calientes."

*Cyclobothra hartwegi* Kunth, Enum. Pl. 4: 231. 1843. "Calochortus hartwegi Benth."

Stems 40 to 50 cm. high; leaves linear, vaginate, the upper ones dilated at base; flowers few, horizontal on stoutish peduncles exceeding the leaves; sepals oblong with no hairs on the inner surface, yellowish, about 5 cm. long; petals larger, broader, ciliate and with a row of hairs extending about two-thirds along the midvein, deeply colored, purplish at the base and shading to yellow at the tip, about 6 cm. long; anthers 0.6 cm. long.

DISTRIBUTION: In the Sierra Madre of Aguas Calientes and Jalisco.

*Specimens examined:*

AGUAS CALIENTES: *Hartweg* 230. (Gray Herbarium.)

JALISCO: In the Sierra Madre west of Bolaños, September 15–17, 1897, *J. N. Rose* 2949.

### 7. CALOCHORTUS CERNUUS sp. nov.

Stem erect, simple or with a few branches, very straight, 20 to 40 cm. high, from a fibrous-coated corm surmounted by a cylindrical mass of dark brown scales; leaves linear, the basal 20 cm. or more long, 5 to 8 mm. broad, the cauline gradually shorter, becoming lanceolate, clasping, the axils bulbiferous, the bracts unequal; flowers nodding on slender upright peduncles; sepals dark brown, lanceolate-oblong, acute, glabrous, 1.5 to 3.8 cm. long; petals larger, purple, ovate, with long, scattered hairs above and a dark-colored gland below the middle, 2 to 2.7 cm. long; filaments 0.5 cm. long, slender; anthers 0.25 cm. long, apiculate.

Type in the Gray Herbarium, collected on Sierra de Tepoxtlan, Morelos, altitude 6,700 meters, September 12, 1900, by C. G. Pringle (no. 9341).

### 8. CALOCHORTUS SPATULATUS S. Wats.

*Calochortus spatulatus* S. Wats. Proc. Amer. Acad. **14**: 267. 1879. "Oaxaca, Ghiesbreght."

Stem simple or branched, about 40 cm. high; basal leaves unknown; cauline leaves linear-lanceolate to lanceolate, dilated at base, clasping; axils bulbiferous; bracts lanceolate; flowers purple, horizontal, on peduncles much exceeding the cauline leaves; sepals and petals spatulate, with a hairy gland a little below the middle; filaments thread-like, 6 to 8 mm. long; anthers 2.5 to 3 mm. long.

DISTRIBUTION: Oaxaca.

*Specimens examined:*

OAXACA: Specific locality not stated, *Ghiesbreght* in 1842.

Type in the Gray Herbarium.

### 9. CALOCHORTUS PURPUREUS (H. B. K.) Baker.

*Fritillaria purpurea* H. B. K. Nov. Gen. & Sp. **1**: 288. 1815. "Crescit locis apricis, aridis Novae Hispaniae prope Patzcuaro, alt. 1130 hexap."

*Calochortus bonplandianus* Schultes f. in Roem. & Schult. Syst. Veg. 7: 1532. 1830. "Humb. et Bonpl. nov. gen. red. Kunth III. p. 288, sub Fritillaria purpurea."

*Cyclobothra purpurea* Sweet, Brit. Fl. Gard. II. **1**: *pl. 20*. 1831. "Fritillaria purpurea Humb. Bonpl. and Kth. nov. gen. et sp. 1 p. 288."

*Cyclobothra propinqua* Schauer, Linnaea **19**: 701. 1847. "In Mexico Aschenb. exs. n. 374."

*Calochortus purpureus* Baker, Journ. Linn. Soc. **14**: 308. 1875. "Fritillaria purpurea, H. B. K. Nov. Gen. **1**: 288 ....."

Stem simple, 20 to 40 cm. high from a fibrous-coated corm; lower leaves narrowly linear, upper lanceolate, acuminate, dilated and clasping; flowers one or two, horizontal, on peduncles exceeding the leaves; sepals oblong-lanceolate, distinctly spotted at the base; petals of the same shape as the sepals and hairy near and on the margins; anthers 5 mm. long; pod erect.

DISTRIBUTION: On the table-lands of central Mexico.

*Specimens examined:*

GUANAJUATO: *A. Dugès* in 1880.

JALISCO: On the road between Huejuquilla and Mesquitec, August 25, 1897, *J. N. Rose* 2589; slopes of canyons near Guadalajara, September 28, 1889, *C. G. Pringle* 2329; Rio Blanco, August, 1886, *Dr. E. Palmer* 338.

### 10. CALOCHORTUS BARBATUS (H. B. K.).

*Fritillaria barbata* H. B. K. Nov. Gen. & Sp. **1**: 288. 1815 "Crescit in montanis prope Guanajuato et Vallodolid Mexicanorum, alt. 1,000–1,100 hexap."

*Cyclobothra barbata* Sweet, Brit. Fl. Gard. I. **3**: 273. *pl. 27*. 1828. "*Fritillaria barbata* Humbl. et Bonpl. nov. gen. red. Kunth."

*Calochortus pallidus* Schultes f. Syst. 7: 1533. 1830. "In Mexico: D. de Karwinsky."

*Calochortus flavus* Schultes f. Syst. 7: 1535. 1830. "*Fritillaria barbata* Humbl. et Bonpl."

*Cyclobothra flava* Lindl. Bot. Reg. under *pl. 1662*. 1834. "*Calochortus flavus* Schultes fil. *Fritillaria barbata* Kunth."

*Cyclobothra pallida* Lindl. Bot. Reg. under *pl. 1662*. 1834. "*Calochortus pallidus* Schultes fil."

*Cyclobothra lutea* Lindl. Bot. Reg. *pl. 1663*. 1834. "*Cyclobothra barbata* Sweet, Fl. Gard. t. 273."

Stem 10 to 50 cm. high, simple or branching from a fibrous-coated corm about 1.5 cm. in diameter; leaves narrowly linear, the radical very long, the cauline shorter, somewhat clasping but not dilated at base; flowers yellow, nodding on long peduncles exceeding the leaves; sepals oblong-lanceolate, narrower than the petals but of the same length, somewhat hairy near the middle but not ciliate, acute, or mucronulate; petals rhombic-ovate, acute, or acuminate, with a densely hairy gland near the base, the hairs yellow or purple and in dried specimens sometimes extending beyond the margins giving the appearance of ciliation; anthers 3 to 4 mm. long, shorter than the filaments.

DISTRIBUTION: Throughout the plateau region of Mexico.

*Specimens examined:*

GUANAJUATO: Mountains, September, 1903, *A. Dugès* 3; 1880, *Prof. A. Dugès.*

SAN LUIS POTOSÍ: In montibus San Moquelito, ex convalle San Luis Potosí, *J. G. Schaffner* in 1876, no. 542; San Luis Potosí, *J. G. Schaffner* in 1879, no. 229; in the region of San Luis Potosí, altitude 1,800 to 2,400 meters, *Parry & Palmer* 891 in 1878.

HIDALGO: Near Real del Monte, *C. Ehrenberg* 18; between Pachuca and Real del Monte, August 31, 1903, *J. N. Rose & Jos. H. Painter* 6702; near El Salto, September 6, 1903, *J. N. Rose & Jos. H. Painter* 7084; on Sierra de Pachuca, July 20, 1905, *J. N. Rose, Jos. H. Painter & J. S. Rose,* no. 8774; between Somoriel and Las Lajas, August 5, 1905, *J. N. Rose, Jos. H. Painter & J. S. Rose* 9237.

MEXICO: Meadows and banks, Flor de Maria, August 1, 1890, *C. G. Pringle* 3185; near Salazar, September 14, 1903, *J. N. Rose & Jos. H. Painter* 7048.

FEDERAL DISTRICT: Valley of Mexico, Zacoalco, August 10, 1865–66, *Bourgeau* 687; near San Angle, August 15, 1905, *J. N. Rose, Jos. H. Painter, & J. S. Rose* 9485; near Tlalpam, August 20, 1903, *J. N. Rose & Jos. H. Painter* 6457; in 1905, 9440; same locality, August 20, 1896, *J. W. Harshberger* 161; hills above Santa Fé, September 4, 1901, *C. G. Pringle* 9302; grassy slopes near Eslaba, September 18, 1903, *C. G. Pringle* 11714; pedregal east of Ajusco, September 8, 1903, *J. N. Rose & Jos. H. Painter* 6842.

OAXACA: Cerro de San Filipe, September 23, 1895, *C. Conzatti* 703; same locality, October 2, 1894, *Charles L. Smith* 745; La Carbonera, September 20, 1895, *Lucius C. Smith* 791.

DURANGO: Papasquiero, August 7, 1898, *E. W. Nelson* 4667.

SPECIFIC LOCALITY UNKNOWN: "Mexico" *Dr. Coulter* 1556, 1557, 1558; "Mexico" *C. Ehrenberg* 259, 754; "cultivated from Pringle's bulbs," 1891. (Gray Herbarium.)

### 11. CALOCHORTUS BARBATUS CHIHUAHUANUS Painter, subsp. nov.

Stem 20 to 30 cm. high, from a fibrous-coated corm about 1.5 cm. in diameter; leaves all linear, the basal broader, cauline clasping; flowers horizontal on long peduncles exceeding the leaves; sepals ovate, acuminate, externally glaucous and purple, internally with a hairy zone along the midvein, 1.5 to 1.8 cm. long; petals broadly ovate, acuminate, the upper half yellow, the basal half purple with a very hairy gland, the entire surface densely hairy; anthers 4 to 5 mm. long.

Type in the U. S. National Herbarium, no. 33323, collected in the Santa Eulalia Mountains, September, 1885, by C. G. Pringle (no. 328).

DISTRIBUTION: In the Sierra Madre of Chihuahua and Durango.

*Specimens examined:*

CHIHUAHUA: Santa Eulalia Mountains, type collection; same locality and date, *Wilkinson*.

DURANGO: Santiago Papasquiaro, April and August, 1896, *Dr. E. Palmer* 415; near Guadalajara, September 28, 1903, *J. N. Rose & Jos. H. Painter* 7381.

MEXICO: Near Tlacotitlan, August 28, 1903, *J. N. Rose & Jos. H. Painter*, 6621; bluffs of barranca below Ozumba, September 24, 1904, *C. G. Pringle* 13223.

OAXACA: Ghiesbreght, 1842.

LOCALITY INDEFINITE: "Recue en Septembre, 1895, de Moro Leon sud del État de Guanajuato en mauvais état." (Communicated to Gray Herbarium by A. Dugés.) Cultivated from Pringle's bulbs, Gillet and Horsford, 1891. (Gray Herbarium.)

# A REVISION OF THE CICHORIACEOUS GENERA KRIGIA, CYNTHIA, AND CYMBIA.

By Paul C. Standley.

## INTRODUCTION.

The revision embodied in this paper was undertaken as the result of an attempt by the writer to determine a cichoriaceous plant from the mountains of northern New Mexico, which came to hand at the New Mexico Agricultural College. The specimen strongly suggested the *Adopogon virginicum* of the Central States, but did not seem to agree in all particulars with the published characterizations of Adopogon. It was finally decided that it must be a Hieracium, although very much unlike most members of that genus in general appearance. This view was strengthened by finding the same plant determined, but never published, by Dr. E. L. Greene as a new species of Hieracium. Accordingly, a description was drawn up and a manuscript name given the plant under this genus. Upon submitting the two specimens to Dr. P. A. Rydberg, however, we were informed that the plant really belonged to the genus Adopogon, although it was admitted that certain of its characteristics were deceptive. Both Doctor Greene and myself had thought that the plant had the pappus of Hieracium, overlooking the row of minute outer scales which are scarcely visible under an ordinary hand lens.

That others have had similar difficulties is shown by the following letter attached to a sheet in the herbarium of the Missouri Botanical Garden. Although written by one evidently inexperienced in botany it shows the difficulties encountered in the usual characterizations of this group of plants.

To Dr. Wm. Trelease:

By this same mail I send you specimens of a member of the Compositae, on which I desire your opinion. I have studied it very carefully, as best I could, and can place it nowhere unless it be *Crepis glauca* T. & G. But this in even the latest monograph is placed only in localities of 3,000 to 6,000 feet elevation in Utah and Oregon.

Upon examination of the National Herbarium material in the Adopogon covers and after consulting the literature of that genus it has been found that the arrangement of this group of the Cichoriaceae

given in most works dealing with it is very unsatisfactory. Generic relationships appear never to have been definitely settled, and the synonymy has never been completely established.

In addition to the material in the National Herbarium the writer has had the privilege, through the kindness of Dr. William Trelease, of examining all that in the herbarium of the Missouri Botanical Garden. He also wishes to express his obligations to Dr. J. M. Greenman and to Prof. L. M. Umbach who have forwarded material for study. In the two larger lots of material examined several sheets of various species of Serinea were found. This genus can readily be distinguished from those treated here by the fact that its achenes are altogether without pappus.

The plants included by most of the later American authors in the genus Adopogon have been described by the botanists who have studied the plants of the eastern United States under several generic and many specific names. Linnæus described two of them in his Species Plantarum under different generic names, one in the genus Tragopogon and the other in the genus Hyoseris, the latter name being now applied exclusively to a European group. Schreber in 1791 made the Linnæan *Hyoseris virginica* the type of the new genus Krigia. In 1829 Don founded the genus Cynthia upon *Tragopogon virginicus*. Since that time some authors have accepted these genera as distinct, while others have merged them in Krigia or in Adopogon.

Torrey and Gray in 1843 considered the genera Cynthia and Krigia distinct. Besides this, they founded under Krigia a new section, Cymbia, for the Nuttallian *Krigia occidentalis*. De Candolle kept the two genera separate, while Bentham and Hooker united them under Krigia. Doctor Gray in the Synoptical Flora followed Bentham and Hooker, but very properly recognized three sections of the genus, Cynthia, Eukrigia, and Cymbia. He also gave a good account of the synonymy of the group, although he omitted numerous published names. When Otto Kuntze published his Revisio Generum Plantarum in 1891 he united all the species of the group under the Neckerian genus name Adopogon. In this he has been followed by Britton and Brown and by Small.

All three of Doctor Gray's sections, the writer thinks, are worthy of generic recognition. The groups are very natural ones, sharply defined, at least as much so as most of the genera of the Compositae. The genus Cymbia here proposed is farther removed from the genera Cynthia and Krigia than those two are from each other, although the latter have been separated by most authors, while Cymbia has never been segregated from the genus Krigia.

Adopogon of Necker is very fully described by that author in the first volume of his Elementa. He names no species, but says that the genus is founded upon certain of the Linnæan Tragopogons.

De Candolle, and later Bentham, suggests that the name was probably based upon *T. virginicus* and *T. dandelion.* Bentham says: "Adopogon * * * est verisimiliter *K. virginica.*" Kuntze evidently concluded that what had been suggested as a possibility was actually the truth and proceeded to transfer to Adopogon all the species of Krigia and Cynthia, Adopogon antedating Krigia by one year. Necker's description of his new genus, however, precludes this use of his name. In the first line upon page 56 of the first volume of the Elementa we read: "Pappus * * * stipitatus;" and again in the ninth line "pappo stipitato." It is true that the description seems to apply to only three of the Linnæan species of Tragopogon, *T. virginicus, T. dandelion,* and *T. lanatus.* It evidently does not apply to either of our American species, neither of which has the pappus stipitate in any sense of the word. After examination of specimens of *Tragopogon lanatus* (*Scorzonera lanata*) the writer is inclined to believe that Necker must have had that plant in mind. The pappus of this plant is hardly stipitate, but the achene is prolonged into a long beak and it may have been this character to which Necker referred. It is sufficient for our purpose that our American plants have not such a pappus. Some writers, notably De Candolle, have suggested that Necker was mistaken in giving this character to his genus, but we may take it for granted that he knew what he was writing about. At any rate the statement is not due to a typographical error or slip of the pen, for it is repeated. Since Necker did not actually name a species as the type of the genus it seems wisest to proceed upon the supposition that in the characterization of the new genus Necker was more accurate than his successors have credited him with being.

Aside from this one name there is little doubt as to the meaning of generic and specific names in this group. Linnæus was very careful in his descriptions of the two species upon which the genera Krigia and Cynthia were founded. There are few species to be maintained—so it seems after careful examination of all available material—and there is, accordingly, little uncertainty regarding the application of the many specific names that have been published in the group at various times. The following treatment of these plants will at least help to make clear the synonymy and true generic and specific relationships of the group.

## SYSTEMATIC TREATMENT.

### KEY TO THE GENERA.

Bracts 5 to 8, erect in fruit, ovate or lance-ovate, distinctly keeled; pappus of 5 broad, conspicuous, obovate scales, with as many alternating bristles; these about twice as long as the scales and scarcely, if at all, longer than the acheme; annuals..... 1. CYMBIA.

Bracts 9 to 18, reflexed in fruit, not keeled or conspicuously nerved, lanceolate or linear-lanceolate; bristles several to many times as long as the scales and twice as long as the achene or more.
Annuals; pappus of 5 round or obovate, rather conspicuous scales and 5 or 10 bristles ..... 2. KRIGIA.
Perennials; pappus of 10 to 15 minute, oblong or linear scales and as many or more bristles ..... 3. CYNTHIA.

### 1. CYMBIA gen. nov.

*Krigia* section *Cymbia* Torr. & Gr. Fl. N. Amer. **2**: 467. 1843.

Annual acaulescent herbs, glabrous or glandular-hispid, with rosettes of thin, glabrous or pubescent leaves, from the midst of which rise numerous scapes bearing heads of ligulate flowers; bracts of the involucre 5 to 8, strongly keeled and nerved, ovate or lance-ovate, acute, erect in age; disk naked; achenes striate, turbinate, glabrous; pappus in two series, the outer row of broad, thin, obovate scales, the inner of usually the same number of bristles, these mostly about twice as long as the scales, seldom or never longer than the achene, the bristles alternate with the scales.

A single species, the type of the genus being *Krigia occidentalis* Nutt.

The characters given in the key to the genera show the principal differences between this proposed genus and Krigia and Cynthia, differences which are believed to be great enough to make it desirable to separate this genus from those older ones.

**1. Cymbia occidentalis** (Nutt.) Standley.

*Krigia occidentalis* Nutt. Journ. Acad. Phila. **7**: 104. 1834.
*Krigia nervosa* Hook. Icon. Pl. 237. 1840.
*Krigia occidentalis mutica* Torr. & Gr. Fl. N. Amer. **2**: 468. 1843.
*Krigia bellidioides* Scheele, Linnaea **25**: 257. 1853.
*Adopogon occidentale* Kuntze, Rev. Gen. Pl. 304. 1891.

TYPE LOCALITY: "In Arkansas, near Fort Smith."

DISTRIBUTION: Arkansas to Missouri, southeastern Kansas, Oklahoma, and central and eastern Texas.

The subspecies *mutica* was simply a form with "bristles of inner pappus altogether wanting." It is scarcely separable even as a subspecies, for the bristles very often fall when the achenes are mature.

The type of Scheele's species was collected on "Galveston Island, auf feuchtem Muschelsand; Römer legit. Aprili 1846." It was said to have white heads, and pappus two or three times as long as the achene; the achenes were said to be five-angled. This might be a distinct species with these characteristics, but the specimens I have seen from Galveston Island differ in no way from the typical form. Upon this species Scheele founded the section Bellidion of the genus Krigia.

### 2. KRIGIA Schreb.

*Krigia* Schreb. Gen. Pl. 532. 1791.

**1. Krigia virginica** (L.) Willd. Sp. Pl. **3**: 1618. 1804.
*Hyoseris virginica* L. Sp. Pl. 809. 1753.
*Hyoseris caroliniana* Walt. Fl. Carol. 194. 1788.
*Hyoseris? ramosissima* Bart. Fl. Phila. Prodr. 75. 1815.
*Krigia caroliniana* Nutt. Gen. N. Amer. Pl. **2**: 126. 1818.
*Krigia dichotoma* Nutt. Gen. N. Amer. Pl. **2**: 127. 1818.
*Krigia tenella* Reichenb. Icon. Bot. *pl. 87*. 1830.
*Krigia petiolaris* Raf. New Fl. N. Amer. **4**: 86. 1836.
*Krigia leptophylla* DC. Prodr. **7**: 88. 1838.
*Krigia virginica dichotoma* A. Gray. Man. 246. 1848.
*Adopogon carolinianum* Britton, Mem. Torrey Club **5**: 346. 1894.

TYPE LOCALITY: "In Virginia." The species was founded upon a plant described by Gronovius.

DISTRIBUTION: Massachusetts, southward through Pennsylvania, Maryland, Virginia, North and South Carolina, Georgia, westward to Illinois, Missouri, Arkansas, Oklahoma, and eastern Texas, and in Washington.

Torrey and Gray recognized two species here, depending upon the shape of the primary leaves for distinguishing characteristics. Among all the material that I have examined I have been able to distinguish but a single species. The plants change their appearance very materially as they grow older, and with the spring and late summer forms before one it seems they must be distinct until one sees the intermediate forms. The Washington plant, one collected between Olympia and Gate City in 1898 by A. A. and E. Gertrude Heller, no. 4052, was deceptive on this account. Coming from a locality so far distant from the common range of the species and showing several apparent peculiarities, it seemed certainly distinct. After examining the Missouri Botanical Garden material, however, it was seen that the same form is found in the Central and Southern States. It seems probable that the Washington plant was introduced into the locality where it was collected, for we have only the single collection of it from west of Kansas.

*Krigia dichotoma* Nutt. is the form with much branched stem; it develops in late summer. *Krigia leptophylla* DC. seems to have been of similar origin. It was characterized as having very narrow leaves, such as the plant develops late in the season. *Krigia petiolaris* Raf., I think, belongs here. As far as the description informs us, it might have been *Cynthia montana*, except for Rafinesque's statement that his plant had small heads. The heads of Krigia are scarcely more than half as large as those of Cynthia, and Rafinesque had seen both genera.

## 3. CYNTHIA Don.

*Cynthia* Don, Edinburgh Phil. Journ. **12:** 305. 1829.
*Luthera* Schultz Bip. Linnaea **10:** 257. 1835.
TYPE SPECIES: *Tragopogon virginicum* L.

### KEY TO THE SPECIES.

Plants acaulescent..... 1. *C. dandelion.*
Plants caulescent.
  Stems reclining, weak, and slender; leaves of the stem numerous. 2. *C. montana.*
  Stems erect, much stouter; stem leaves only one or two pairs of much reduced, often bract-like leaves.
    Upper leaves prominently aquiline-serrate..... 3. *C. falcata.*
    Upper leaves entire.
      Leaves glaucous. Of the eastern and central United States..... 4. *C. virginica.*
      Leaves bright green, not glaucous. Of the mountains of New Mexico and Arizona..... 5. *C. viridis.*

**1. Cynthia dandelion** (L.) DC. Prodr. **7:** 89. 1838.
*Tragopogon dandelion* L. Sp. Pl. ed. 2. 1111. 1763.
?*Hyoseris major* Walt. Fl. Carol. 194. 1788.
*Hyoseris angustifolia* Michx. Fl. Bor. Amer. **2:** 87. 1803.
*Troximon dandelion* Pers. Syn. Pl. 560. 1807.
*Krigia dandelion* Nutt. Gen. N. Amer. Pl. **2:** 127. 1818.
*Cynthia lyrata* Nutt. Journ. Acad. Phila. **7:** 68. 1834.
*Cynthia boscii* DC. Prodr. **7:** 89. 1838.
*Cacalia tuberosa* Bosc.; DC. loc. cit.
*Adopogon dandelion* Kuntze, Rev. Gen. Pl. 304. 1891.

TYPE LOCALITY: "In Virginia." The species was founded upon a plant described by Gronovius.

DISTRIBUTION: Maryland and Virginia, southward to North Carolina, westward to eastern Texas, Oklahoma, and southeastern Kansas.

**2. Cynthia montana** (Michx.) Standley.

*Hyoseris montana* Michx. Fl. Bor. Amer. **2:** 87. 1803.
*Krigia montana* Nutt. Gen. N. Amer. Pl. **2:** 127. 1818.
*Cynthia dandelion montana* Chapm. Fl. South. U. S. 250. 1860.
*Adopogon montanum* Kuntze, Rev. Gen. Pl. 304. 1891.
TYPE LOCALITY: "In altissimis montibus Carolinae septentrionalis."
DISTRIBUTION: Mountains of North and South Carolina and Georgia.

**3. Cynthia falcata** sp. nov.

A perennial plant 40 to 50 cm. high; basal leaves erect, oblong in outline, acutish, glaucous, pinnatifid toward the base, the segments linear, ascending or divergent; leaves on slender, narrowly winged, purplish petioles; stem stout, strongly striate, purplish, bearing an oblong, acute, purplish leaf about the middle, this obtuse or clasping at the base, aquiline-serrate (that is, with falcate teeth directed forward); peduncles several, naked or bracted at the base, the bracts when present entire; peduncles short, strongly hispid just below the heads; involucral bracts 15 to 18, about 1 cm. long; fruit as in *C. virginica*, with tawny pappus several times as long as the achene.

Type in the U. S. National Herbarium, no. 415971, collected at Turin, Michigan, June 21, 1901, by Bronson Barlow. A very different plant from *C. virginica*, readily distinguished by the peculiar toothing of its leaves.

**4. Cynthia virginica** (L.) Don, Edinburgh Phil. Journ. **12:** 309. 1829.

*Tragopogon virginicus* L. Sp. Pl. 789. 1753.
*Hyoseris biflora* Walt. Fl. Carol. 194. 1788.
*Hyoseris amplexicaulis* Michx. Fl. Bor. Amer. **3:** 87. 1803.
*Hyoseris prenanthoides* Willd. Sp. Pl. **3:** 1615. 1804.
*Troximon virginicum* Pers. Syn. Pl. **2:** 560. 1807.
*Krigia amplexicaulis* Nutt. Gen. N. Amer. Pl. **2:** 127. 1818.
*Cynthia griffithsii* Nutt. Journ. Acad. Phila. **7:** 69. 1834.
*Luthera virginica* Schultz Bip. Linnaea **10:** 257. 1835.
*Krigia integrifolia* Raf. New Fl. N. Amer. **4:** 86. 1836.
*Adopogon virginicum* Kuntze, Rev. Gen. Pl. 304. 1891.
TYPE LOCALITY: "In Virginia, Canada."

*Krigia integrifolia* Raf. I take to be this species, although one can not be certain from the description. It came from "Mts. Alleghanies." *Cynthia griffithsii* Nutt. seems to belong here, but Nuttall thought it very different from his *Hyoseris amplexicaulis*.

DISTRIBUTION: Pennsylvania and New Jersey south to North Carolina, westward to Minnesota, Missouri, eastern Kansas, and eastern Texas.

*Cynthia virginica* seems to be a polymorphic species, and it is very possible that some of these supposed synonyms must at some time be restored or new names given to various segregates. The plant of North Carolina, Georgia, and Tennessee is notable because of its large size, vigorous habit, and large leaves and heads. Its peduncles are always hispid just below the heads. The form found in Pennsylvania and New Jersey is marked by its numerous leaves and glabrous peduncles. The most common form is a plant with inconspicuous cauline leaves, of rather low stature, and with glabrous peduncles. It is the form common through the central part of the range from Virginia westward. Two specimens, one from northern Ohio and one from the Mammoth Cave, Kentucky, attract one's attention because of their long, narrow, entire basal leaves. The Minnesota form is characterized by its much-branched

stem and small heads. A form common in Missouri and found also elsewhere has all its radical leaves pinnatifid with very obtuse segments. Certain Indiana specimens have filiform bracts scattered along the peduncles. Several other forms have been noted, but with our present herbarium material it seems inadvisable to attempt to segregate any of these forms either specifically or subspecifically. The two species separated here have constant and well-marked characters.

**5. Cynthia viridis** sp. nov.

A perennial plant 30 cm. high or less, with rather coarse, almost fleshy roots; leaves ascending or spreading, thin, bright green, oblong to elliptical or oblanceolate, acutish, attenuate into a slender winged petiole, entire or remotely and shallowly dentate, about 10 cm. long; stems with one or two ovate-lanceolate clasping, bract-like leaves at about their middle; rising from their axils two or several long, slender peduncles, these glandular-hispid just below the heads; involucral bracts 8 or 9 mm. long, the heads about 18 mm. high; achenes light or dark brown, cylindrical, striate, the tawny bristles of the inner pappus twice as long; outer row of pappus of minute, linear scales visible only under a strong lens.

Type in the National Herbarium, no. 498744, collected near Cowles, in the Pecos River National Forest, San Miguel County, New Mexico, altitude about 2,400 meters, July 11, 1908, by Paul C. Standley (no. 4418). The plant was rare in the region, and only a few individuals were found at this station. They grew on a steep hillside under pine trees. On August 1 it was re-collected at Harvey's Upper Ranch, about 20 miles to the southeast, at an altitude of about 2,900 meters (*Standley* 4644). This southwestern plant seems amply distinct from *C. virginica* in its green leaves and more slender habit. Between the mountains of New Mexico and the eastern part of Kansas there intervenes a large area in which no representative of the genus seems to occur.

*Other specimens examined:*

NEW MEXICO: Upper Pecos River, July, 1904, *Mrs. W. H. Bartlett;* West Fork of the Gila, in the Mogollon Mountains, Socorro County, 1903, *O. B. Metcalfe* 578; Las Vegas Hot Springs, August, *F. H. Snow;* Fresnal, July 21, 1899, *E. O. Wooton;* Gallinas Planting Station, August, 1908, *Mrs. W. H. Bartlett.*

ARIZONA: Willow Spring, 1890, *Dr. Edward Palmer* 539.

# NEW OR NOTEWORTHY PLANTS FROM THE EASTERN UNITED STATES.

By Edward S. Steele.

All of the species here offered as new, with a single exception, are based entirely upon my own collections made upon vacation trips or in one case upon a partly official one. They are all supported by copious material, which in most cases could have been increased indefinitely. The few notes made on previously known plants are based on personal field work.

Several of the species considered are inhabitants of a type of land widely distributed through the mountains of middle Virginia which might well be denominated "shale barrens." This land is made up of exposures of shale in different stages of disintegration, these at the point chiefly investigated consisting of the Romney formation of the Lower Devonian. In the valleys these are reduced to a heavy clay, originally covered with good forest and when cleared susceptible of tillage. But the declivities and uplands bear at most a low and open growth of oak and pine or frequently a still lower growth of scrub oak, kalmia, and other shrubs, in either case with admixture of herbaceous plants. The formations are so open that over large areas they can be penetrated on foot with no great difficulty. The barrenness is perhaps largely due to the constant washing away of the finer particles of soil, but in some cases it seems as if it must be chargeable to chemical composition. The plant covering, I should say, is mildly xerophytic, but there is no evidence of extreme drought. On the contrary, the vegetation here maintains itself through the season even on sunbeaten slopes as well as that on other soils similarly situated. The variety of plant life is very considerable, and together with many plants well known on other substrata, these barrens possess a number of species peculiar to themselves. So far as observed by me these, with the possible exceptions of one Crataegus and one rose, are all herbaceous or scarcely shrubby plants. The total number may not prove to be very great. Some of them were contained in Mr. Mackenzie's collections at White Sulphur Springs, Greenbrier County, West Virginia; a few more are described here, not, however, completing the list.

At the western end of the railroad tunnel at Millboro, Bath County, lies one of the most fascinating spots in which it has been my fortune to botanize. The geological formation is entirely of this shale. The tunnel opens into a recess in the mountain, and the road after following the side of this a short distance passes over a deep valley by what is known as the "Big Fill." The situation is sufficiently picturesque, but the fascination chiefly lies in the unique content of the plant covering. Here within an area of perhaps half a square mile, with much up and down, occur, besides an abundance of the until recently little known *Oenothera argillicola* and *Eriogonum allenii*, at least a dozen native species thus far unknown to northern manuals, six or eight of them entirely undescribed. Oddly enough a rare introduction occurs along the railroad at the same spot, together with a second (true *Lactuca scariola*) not very common in the East.

Not all of the dozen species referred to are peculiar to this substratum, but probably half of them are so. The *Oenothera argillicola* and *Eriogonum allenii* are very characteristic plants, yet they grow only in certain special situations, namely, on shale cliffs or cliff-like places and denuded clay banks. They are very fond of railroad embankments.

In 1910 I made good collections, chiefly of golden-rods and asters, in Garrett County, Maryland, from which a pleasing aster may be published at once. The country here is a hilly plateau with much good farming land. There is a wide difference between the flora of this region and that of the mountains farther south, due to altitude, latitude, and soil.

Collections made in 1909 in Wisconsin and Indiana in connection with a Laciniaria expedition enable me to set at rights one Solidago long imperfectly known and to introduce another wholly undescribed.

A visit to central Illinois in August, 1910, primarily for other purposes, admitted of considerable collecting and observation. The opinion already entertained was confirmed that the State of Illinois has never been thoroughly collected over in a modern sense. Besides the fine new golden-rod and evening primrose here presented, other critical material was obtained which awaits later disposition.

I take this opportunity to call attention to the botanical situation in the nearer West, in the hope of arousing some active interest in preserving the record of a unique and interesting flora fast passing away and perhaps also in the maintenance of some living remainders of the flora itself. In the Eastern States some native plants will become scarce, but few will become entirely extinct. The same can not be said of Illinois. The difference is due to two circumstances: First, the natural conditions admit of a well-nigh universal and highly destructive agriculture; second, many of the native species can not maintain themselves where the original conditions have been

altered. Illinois is a vast empire, and it must not be imagined that it is everywhere alike, yet it is true that over a large part of its area there is scarcely a foot of waste land. In the wooded country the cow takes what the plow omits. The drainage of low grounds is dispossessing the moisture-loving tribes which for a time were comparatively safe. The now universal practice of mowing the railroad rights of way (where these are not cultivated) is driving the ordinary prairie flora from almost its last refuge. The practice of mowing the roadsides also prevails in advanced communities, and, commendable as it is, it still further diminishes the botanist's resources.

In spite of all difficulties, I believe it is still possible to collect nearly every plant which belonged to the original Illinois flora. The mowing of the railroads is largely delayed to the latter half of August, and some tracts escape even into September. It is likely also that temporary reservations of select strips could be secured if our scientific institutions would take hold of the matter. The railroads which were built before the prairie had been broken are those which chiefly deserve attention. A very fine display of old prairie was observed in 1910 along the Wabash Railroad, especially between Decatur and Springfield. Besides this resort, there are occasional neglected cemeteries and schoolhouse yards which help a little. In broken ground, as the bluffs of the Illinois River, native plants find a certain amount of protection, as do also plants of a certain class on moist flats of streams.

What has just been said of conditions in Illinois is true or becoming true of the whole prairie region and, indeed, with qualifications, of all our better agricultural areas. Already in North Dakota Doctor Lunell speaks of the imminent danger of the loss of species.

The case is one which requires prompt action. Vegetable physiology can wait, but these plants must be collected now or never. Yet so slight is the local interest that the University of Illinois is at present offering no instruction in systematic botany, on the ground that there is no demand for it. It should be remembered, however, that the local demand for a study is much regulated by the presence or absence of an enthusiastic representative of the science. At the same time the great botanical establishments of the country are devoting a large part of their energies to the floras of lands which are not even dependencies of the United States. In 1909 I collected many undescribed species almost under the eaves of an institution which is engaged upon the flora of South America.

One cause of the present neglect is probably the absorbing interest of the young science of plant ecology and the narrow view taken by some of the ecologists. About all the use which the class of students referred to seem to have for taxonomy is to supply them a convenient means of labeling the plants whose adaptations they wish to study.

While this specialization is doubtless justifiable up to a certain point, the time will soon come when these physiological-ecological investigations must be supplemented by and brought into relation with phylogenetic considerations. When this stage is fully reached it is manifest that the knowledge of every type available will be a matter of vital concern, and even forms of no great floristic interest may prove to be of large historical value. To illustrate, I possess as a loan a single incomplete specimen of a Laciniaria from Illinois, with characters rare in that region and so related to species there and elsewhere as to throw a strong ray of light on the history of a group. It is very possible that this species will never be collected again. Recently, however, (in my 1909 collection) a single specimen of a related species has come to light. Not all forms, of course, have as much significance, but we can not afford to lose any of them. Taxonomy, if we mean thereby merely an arrangement for convenient reference, is of course merely ancillary; but if it means the orderly expression of phylogenetic relations it ceases to be a mere tool and becomes the embodiment of some of the highest aspirations of botanical science.

But even from an ecological point of view it can easily be shown that the study of this flora is urgent. The Illinois flora, ecologically considered, is intermediate in type between that of the wooded country and that of the subarid region farther west, and only by a careful attention to species can the different areas be accurately marked out. My own Laciniaria studies have shown that of a swarm of species of the *scariosa* type naturally inhabiting Illinois and Wisconsin not a single one reaches the western boundaries of Missouri and Iowa, while only a few are known to cross the Mississippi at all, though it is probable that a considerable number do. In like manner there is an almost if not quite complete replacement of species in passing from northern Illinois to southern Minnesota. I put it to the ecologists themselves whether any accurate phytogeographical results can be obtained where a hundred types are bulked in one.

What is needed is a systematic and thorough survey conducted by qualified persons. While the work of the stronger amateurs has been of immense value and while the efforts of amateurs whether stronger or weaker are to be earnestly encouraged, yet it is plain that these volunteer performances are insufficient. For one thing they are sporadic and fragmentary. But besides this only experts can make the requisite discriminations. Even collectors of experience often fail to recognize the new species in their own collections, particularly outside of a certain range within which their individual interest has been peculiarly awakened. They also pass by plants which are really of new species because they are confounded with species already collected.

It would be desirable also to establish preserves for native plants where unspoiled areas can still be found, and also to put to experimental test the possibility of restoring on agricultural ground primeval conditions of soil and flora. At least, it can not be too much to ask that such magnificent plants as *Silphium laciniatum* and *S. terebinthinaceum* and some of the Laciniarias of the *scariosa* type should be preserved in an adequate number of botanical gardens. The buffalo has been rescued from extinction, why not the compass plant?

**Anychia divaricata** Raf. Neogenyton **4**: 42. 1825.

Plant of a dull green aspect or at maturity with some reddish brown, low, dichotomously intricate, at length horizontal-spreading, sometimes to a breadth of 20 cm. or more, but not humifuse, 4 or 5 cm. high, minutely hirsute; trunk 2 or 3 cm. high, bifurcating at the fourth or fifth manifest node or lower, one or two pairs or half pairs of weak spreading branches at and below the first bifurcation, or commonly none, the internodes short, especially toward the extremities; leaves oblanceolate, punctate-roughened, the margin entire and naked, acute and mucronate at the apex, the largest 2 cm. long, the outermost not exceeding 2 or 3 mm.; stipules ovate-lanceolate; calyx segments 3-nerved, the hoods somewhat apiculate; style entire, but with two stigmas; stamens 5.

According to Rafinesque, "Found from the Alleghany Mountains to Kentucky on hills."

First collected by the writer on Stony Man Mountain in the Blue Ridge, Page County, Virginia, August and September, 1901 (no. 242), where it abounds at an altitude of about 1,200 meters. It has since that time been collected by me in the same State, near Eagle Rock, Botetourt County, and on Johns Creek Mountain, Craig County (both as no. 3), in 1903; near Goshen, Rockbridge County, 1904; at Millboro, Bath County, 1906; at Augusta Springs, Augusta County, 1908; and in West Virginia, on Peters Mountain, near Old Sweet Springs, Monroe County, 1905.

The National Herbarium has further the following specimens:

VIRGINIA: Nottingham County, Massanutten Mountain, *Heller & Halbach* 1090; Warren County, Cedarville, *G. S. Miller*, July 17, 1897.
NORTH CAROLINA: Polk County, Columbus, *E. C. Townsend*, June 30, 1897.
GEORGIA: Walker County, Pigeon Mountain, *Harper* 337 of 1900.
WEST VIRGINIA: Wyoming County, Baileysville, *E. L. Morris* 1254a; Morgan County, Berkeley Springs, *H. D. House* 1570.
MARYLAND: Washington County near Sideling Hill, *Shreve & Jones* 796.
PENNSYLVANIA: Bedford County, Hyndman, *John K. Small*, August 19–23, 1890 (2 sheets).

In contrast with this plant *A. polygonoides* is of an erect habit, bifurcates at about the seventh node, has several pairs of branchlets below, has the leaves longer and perceptibly, though minutely, spinulose-serrulate, has the style divided nearly to the base, and has but 2 stamens. The stipules are also somewhat narrower and the calyx segments more prominently nerved and more apiculate. It is also a blue green plant while the present species is dull.

Doctor Robinson in his paper on the identity of *Anychia dichotoma* [a] has correctly cited my Stony Man no. 72 under *Anychia polygonoides*, but wrongly my 242, which is of the present species. He nowhere in the paper even canvasses the possibility of *A. divaricata* being a good species. He doubtless failed to note the undivided style and the five stamens. The low branching and the spreading habit are also good characters and in well-developed specimens very conspicuous.

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[a] Rhodora **6**: 53. 1894.

In many large specimens the plexus of branches is very dense but in others here admitted it is very much thinned out. There seems to be a gradation from one to the other form.

This species is not to be confused with a plant, abundant in some places near Washington, which approaches *A. polygonoides* in habit but has the leaves and ultimate branches gathered into close clusters, giving the aspect of a "resurrection plant." This is not a condition due to drought, as it occurs early in the season and where moisture is not lacking. It has the habit of a miniature American elm. There are also similar specimens from Pennsylvania, West Virginia, and Kentucky. This is a true Anychia, having the style cleft, but I am not sure of its specific status. It may grade into *polygonoides*, but I doubt this.

*Anychia divaricata* has not been found near Washington and all the settled specimens are from the mountain country. It occurs on denuded ground, not objecting to a deserted field or a roadside, and is not particular about soil, occurring both on shale and siliceous ground, whether on limestone not known. It will endure drier and more sterile conditions than *A. polygonoides*, yet not seldom occurs in the same vicinity.

I leave it to Doctor Small, who is already acquainted with this plant, to transfer it to Anychiastrum, if he sees fit. These notes, representing my independent observations, will hardly be amiss.

**Clematis viticaulis** Steele, sp. nov.

Rootstock densely clad with slender fibers, these sometimes reaching 30 cm. long with little diminution of size; stems woody at least at the fruiting season, often several from one stock, flexuous-ascending, putting forth one or two branches from the corbel-like expansion of each node, thus forming a round, bushy head 35 to 40 cm. high; branches slender, flexuous, except the strong subbasal ones not further subdivided; stems and branches elastic, with a thin bark upon breakage splitting into strips, brown at maturity, finely puberulent with crisped hairs, the internodes short at the base, in the middle 4 to 5 cm. long, above reduced to 3 or 4 cm.; leaves numerous, with a thick petiole 2 mm. long or under, this puberulent like the stem but not brown; leaf blade rarely if ever lobed, from broadly lanceolate to narrowly ovate, the better developed 45 to 60 mm. long, 12 to 25 mm. broad, blunt but mucronate at the apex, rounded at the base; toward the extremities and on weak branches considerably smaller and rather less abruptly narrowed below; all the leaves glabrous above but with some short hairs on the veins beneath, firm in texture, the margin entire, somewhat revolute, five-nerved below, two nerves lost above the middle, strongly reticulate, the veins prominulous on both sides, especially beneath, the ultimate veinlets, however, obscure, the reticulation thus appearing less fine than in *C. ochroleuca;* flowers not seen, few, single at the ends of the principal branches, these never exceeded by their own subdivisions, hence the flowers never in a fork; fruiting heads on peduncles 1.5 to 2 cm. long, the cluster of achenes 7 or 8 mm. long, a little broader; achenes 12 to 18, rimmed as in *C. ochroleuca*, etc., oblique, the body 5 mm. long, copiously soft-pubescent, the hairs of the nucleal portion often longer and longitudinally placed, the tails 18 to 25 mm. long, their barbs silky, of a bright rusty yellow.

Type in the U. S. National Herbarium, no. 494534, collected at Millboro, Bath County, Virginia, altitude 500 meters, September 3, 1906, by E. S. Steele. It grows on disintegrating shale. Several specimens were preserved, of which four were mounted for the National Herbarium.

This plant was presumed to be the same as that known from Cates Mountain, White Sulphur Springs, West Virginia, but upon comparison was found to be quite different, though of the same group. The National Herbarium has four specimens of the Cates Mountain plant, all in the vernal stage. These have the leaves relatively small and rather more tapering at the base, but do not exhibit any decisive difference from *C. ochroleuca.* Another West Virginia specimen (not more definitely located, *F. V. Coville* in 1890) has ripe heads which are smaller and whiter tailed than those of

*ochroleuca*, the achenes seeming somewhat more oblique. Its leaves are none of them so large as is usual in *ochroleuca*. Granting that these represent a distinct species, *ovata*, the present species is still left standing quite apart. Its slender, woody stems, short internodes, and numerous branches and numerous small leaves distinguish it from either species. The fruit greatly resembles that of *ochroleuca* except that the tails of the achenes, though of the same color, are considerably shorter, the heads therefore smaller in outline.

**Arabis serotina** Steele, sp. nov.

Plant 40 to 100 cm. high, glabrous throughout; stem slender, in strong specimens fairly stout below, never thick and soft, rarely collapsing in pressing, mostly purplish and minutely pale-flecked, the summit and the branches green, much branched even in small individuals, the branches long and slender, more spreading than ascending, rarely subdivided; basal rosette wanting at flowering time, a dense lateral tuft of small spatulate leaves with a dentate margin shown in one specimen; cauline leaves linear-oblanceolate or somewhat spatulate, entire or repand-denticulate, narrowly inserted (not clasping nor auriculate), the larger 5 to 7 cm. and perhaps 10 cm. long, the lower gone at flowering time; leaves of the inflorescence similar but smaller, mostly on the main axis, one to rarely three small ones on the stronger branches, the plant leafless with the ripe fruit; flowers in loose racemes, often occupying less than half the length of the branches; pedicels at flowering time 3 to 5 mm., in fruit 8 to 10 mm. long, often bent near the insertion, otherwise straight or somewhat curved; whole length of flower including stamens 4 to 5 mm.; sepals barely over 2 mm. long, the sides slightly excavate below, the blade-like upper segment elliptical-oblong, very obtuse; petals exceeding the sepals by 0.5 mm. or more; stamens decidedly exserted; silicles drooping either by the position of the pedicel or very often by their own curvature, when mature mostly 6 to 7 cm. long, 1.5 mm. wide; seeds a little larger and more broadly winged than in *A. laevigata*, including wing 1.5 to fully 2 mm. long, the radicle frequently distinguishable under a lens the whole length of one side and across one end.

Type in the U. S. National Herbarium, no. 494495, collected at Millboro, Bath County, Virginia, altitude 490 meters, August 21, 1907, by E. S. Steele. On lightly wooded slopes of crumbling shale. The exact locality is at the west end of the railroad tunnel, near Millboro station. Several other specimens of the same date were secured and others in a more advanced stage had been secured in September of the previous year.

This plant was at first taken to be *Arabis laevigata burkei* Porter, which it resembles in several particulars of the description, but Doctor Rose, who kindly compared a specimen with Porter's material at the New York Botanical Garden, thinks the two are not the same. In any case, it is out of the question to refer this in any way to *A. laevigata*. Even if we disregard the fact that it is in perfectly normal bloom the middle of August while *A. laevigata* blossoms in April and May, the differences are fully of specific worth. The most striking are in the small flowers of the present plant, its narrow nonsagittate leaves, its more slender and woody stems, and its numerous spreading branches.

**Euphorbia falcata** L.

An abundant growth of this plant was found at the west end of the railroad tunnel at Millboro, Virginia, where so many native novelties occur. A few specimens were also met on the railroad near Mount Elliott Springs, Augusta County. It is a plant of the style of *E. peplus*. The determination was kindly verified at the Gray Herbarium.

**Oenothera canovirens** Steele, sp. nov.

Stem 1 to 1.5 meters high, rather stout, woody, usually branching at the very base or somewhat above and also at the summit, the branches ascending, the bark downwardly splitting and scaling off, the surface clad with a dense cinereous puberulence interspersed with long, more or less flexuous, gray hairs, none tuberculate; leaves numerous and crowded, excurved-ascending, below 9 to 10 cm. long, at the base of

the inflorescence 6 to 7 cm., lanceolate-oblong, 12 to 14 mm. wide, curvately narrowed above but at last very acute, below narrowed by more rapid curves to a short, broad petiole distinguishable even in the upper leaves, closely repand-denticulate, regularly feather-veined, the midvein broad, in texture thick, somewhat succulent, the surface densely cinereous-pubescent, blue green; summit of axis and commonly several branches spicate, the young parts, including ovary and calyx, very canescent; whole length of flower 4 to 4.5 cm.; calyx segments on the point of spreading about 21 mm. long, separating commonly in pairs, the appendage terminal, subulate, at maturity fully 4 mm. long; petals triangular-obcordate, about 14 mm. long and 13 mm. wide, in fading very rufous at base; capsule truncate-lanceolate in section, somewhat curved, 3 cm. long, perhaps longer, tomentulose, also thickly beset with upwardly appressed, falcate hairs, the recurved tips of the capsule segments 2-lobed.

Type in the U. S. National Herbarium, no. 618797, collected along the St. Louis division of the Chicago, Burlington, and Quincy Railroad, about 2 miles south of Concord, Morgan County, Illinois, August 20, 1910, by E. S. Steele.

Found in good quantity on prairie soil, which had once been cultivated, but not for 30 years or more, yet had not recovered its original Silphium and Laciniaria flora. Doubtless one of a number of true prairie plants, such as *Monarda mollis* and *Helianthus grosseserratus*, which have the power of maintaining themselves on ground which has been plowed and again left to itself. *Oenothera biennis* was much more abundant on the same ground, probably also native.

*Oenothera canovirens* in habit resembles *O. biennis*, except that the branches are more erect. The latter species, as met in the field, either in Illinois or around Washington, is not "usually simple," as stated by the New Gray's Manual. The leaves of *O. canovirens* differ from those of *O. biennis* in number, position, size, form, texture, indument, and color, and in fact they are unique in their characters. In indument *O. canovirens* is perhaps most resembled by *Onagra strigosa* Rydb., but except in flowers and fruit there is not much comparison even in this regard, while the low, stout habit and unequal foliage lengths of the latter give it quite another manner. The narrowly oblong tendency of the leaves in *O. canovirens* is to be noted in contrast with familiar species. In the field a marked difference was observed in the position of the stamens of this plant after anthesis as compared with those of *O. biennis*, but I seem not to have made a note and the detail now escapes me.

**Oenothera parviflora** (?) L. Syst. Nat. ed. 10. **2:** 998. 1759.

Commonly bushy, 1 to 1.5 meters high, dividing at or moderately above the base into long upcurved-ascending branches, these with short branches near the summit or undivided, the stems thinly appressed-puberulent and with rather copious longer hairs, many of these clearly tuberculate at the base, the tubercles red or green, inclined to be longitudinally narrow; leaves numerous, lanceolate or oblong-lanceolate, somewhat petiolate, the largest 12 to 13 cm. long and 16 to 20 mm. wide, reducible, however, to 9 cm. long and 14 mm. wide, acute and often more or less acuminate, unevenly repand, either distinctly or feebly denticulate, in the dry state rather thin and firm but with a suggestion of succulence when green, minutely strigose beneath with longer hairs on the midvein, above glabrate; calyx tube slender, from under 3 to 4.5 cm. long; body of full-grown bud 7 to 8 mm. long; calyx tube and segments nearly glabrous, some short stiff hairs near the summit, the segments separating singly; appendages pronouncedly infraterminal, rather horn-like, 1 to 4 mm. long; petals triangular-obcordate, reaching perhaps 11 mm. long, in dried specimens often seeming much smaller, a little narrower or broader than long, of a slightly greenish yellow; infructescence in strong plants becoming 20 to 30 cm. long, often more or less paniculate at the base, very woody, the capsules moderately tapering from near the base, the largest little exceeding 2 cm. long, glabrous, the excurved apices of the segments often 2-lobed, the valves distinctly feather-veined.

This species is very common in sandy or gravelly ground, found also on clay, in the vicinity of Washington. The most robust growth seen was in a sandy field on the

banks of the Potomac above Plummers Island, Montgomery County, Maryland, but it grows freely on the outskirts of the city, and at Tacoma Park, Hyattsville, etc. It has also been collected by me near Eagle Rock, Botetourt County, and on a shale cliff at Millboro, Bath County, Virginia. It is therefore likely to be distributed over a large part of Maryland and Virginia. Notwithstanding its local abundance, the National Herbarium contains little if any material outside of my own collections, collectors having perhaps taken it as an imperfect *biennis*. Doctor Greene noticed the plant independently. It is fair to assume that this is rare or wanting in other herbaria, whence its failure to find a place in the manuals.

This plant was long regarded by me as *Oenothera parviflora* L. In the original description the distinction from *O. biennis* turns upon the small flowers, as indicated by the name, and upon the stem being smooth and subvillose instead of scabrous, with the secondary difference of having the margin of the fruit summit 8-fid instead of 4-fid. In edition 2 of the Species [a] much fuller notes are given, including the statement that the stem is sprinkled with hairs, but without tubercles at their base. Now it is a fact that the present species often has the tips of the capsule segments distinctly 2-lobed, though this character is not uniformly maintained. But it is also true that the stem is normally supplied with tubercles, bright red or greenish, and evidence is wanting that these are ever entirely wanting below the inflorescence. On the other hand, again, if we accept the description in the second edition of the species as proof, the infraterminal position of the calyx segment appendages makes strongly for identification with *O. parviflora*, and there is no other discrepancy except that the leaf form of the latter and that of *O. biennis* are both given as ovate-lanceolate, whereas the leaves of my plant are decidedly narrower than those of *O. biennis*.

It was only at a late hour (through the monition of Mr. H. H. Bartlett, a thorough student of this group and independently acquainted with this species) that I became aware of Miss Vail's description [b] of supposed *O. parviflora*. There are several points in the description which suggest a species different from the present; the cauline hairs of my plant are scarcely spreading and are many of them tuberculate; the leaves do not tend much to be oblong and are not approximately denticulate above; the flowers often exceed the bracts, which are not divaricate, and the petals are delicate, not firm; the capsules are essentially glabrous. With present light I am not ready to offer a positive conclusion as to the status of the local plant.

**Solidago gillmani** (A. Gray).

*Solidago humilis gillmani* A. Gray, Proc. Amer. Acad. **17:** 191. 1882.
*Solidago racemosa gillmani* Fernald, New Gray's Man. 791. 1908.

Stems sometimes ascending from flat sand, then 50 to 60 cm. long, sometimes reclining on the sides of dunes, then much lengthened, sometimes to 110 cm., normally stout, but especially so in the low forms, purpled at least toward the base, glabrous to the inflorescence, here, with the branches, puberulent, especially toward the extremities; leaves of the sterile tufts 12 cm. long or under, the blade and petiole of about equal length, the latter margined and ciliate with delicate white hairs, the blades oval, the larger 18 to 22 mm. broad, the summit ovate or triangular-ovate, blunt, mucronate, the base somewhat more tapering; or, especially in the smaller leaves, the blade more oblong, the summit rounded, the whole leaf truly spatulate; lower stem leaves rarely 14 cm., often 8 to 10 cm. long, the proper blade much as in the basal tufts but relatively longer, 15 to 25 mm. broad; following leaves gradually reduced, sessile by a cuneate base, the uppermost lanceolate; both the basal and the stem leaves, except the upper, crenate-serrate, or sometimes the teeth acute; all the leaves thick, coriaceous, dull green, glabrous except the scabrous margin, coarsely reticulate, the lines strong, rather dark, impressed above, prominulous beneath; inflorescence rather

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[a] Page 492.

[b] In Macdougal, Vail, and Shull, Mutations, Variations, and Relationships of the Oenotheras, p. 71. 1907. (Carnegie Institution.)

heavy, paniculate by simple racemes distributed along the axis, the lower branches moderately lengthened, excurved-ascending; peduncles 3 to 8 mm. long, naked except at the summit or with one or two lateral subulate bractlets; heads campanulate, including disk 8 to 9 mm. long; tegules[a] not manifestly glutinous, the basal ovate, the others oblong, ovately narrowed to the apex, broadly green-keeled (the two green ridges nearly coalescent); florets 22 to 34, those of the disk 6.5 to 7 mm. long, the achenes with scanty delicate, strigose hairs; rays about 8, oblong, 3.5 mm. long, of a rather deep yellow.

The description is based chiefly on an abundance of fresh material from the dunes and flat sands about the head of Lake Michigan:

INDIANA: Dune Park, Porter County, *Steele* 167, 168, September 17, 1909; Pine, Lake County, *Steele* 177, September 20, 1909.

Other material, doubtless the same, is as follows:

INDIANA: Pine, Lake County, *E. J. Hill*, September 13, 1879 (Herb. Univ. Ill.); Millers, Lake County, *L. M. Umbach*, September 3, 1897 (Nat. Herb.).

MICHIGAN: St. Joseph, *Henry Gillman*, October 10, 1872 (Gray Herb.); South Haven, *L. H. Bailey*, September 24, 1880 (Nat. Herb.)

All the Gray Herbarium material referred to *S. racemosa gillmani* (including the Gillman specimen mentioned) was courteously loaned for comparison. The specimens perhaps all belong to the species here described, but no one of them is a normal plant. The Gillman example is broken off above and abnormally branching below, the base not shown. There are besides this a garden specimen "from Mr. Gillman's plant," specimens grown from Lake Superior roots sent by Boott, and a Kew specimen supposed to be from the same source; also a sheet from Tobermory, Bruce Peninsula, southwestern Ontario, collected by John Macoun (same in Nat. Herb.). The cultivated plant is greatly altered, the leaves of the sterile tufts being much elongated, and the panicle, in one case especially, much overgrown. The very imperfect Macoun specimens show also the exaggerated panicle, but lack the basal features.

Disregarding the Macoun plant, it seems nearly certain that all the material here in view is of the same species, in spite of the startling contrast between the garden specimens and the Indiana material, especially the flat sand form. The garden specimen from Gillman's plant is so much like the Lake Superior cultures as to leave no ground for a separation. At the same time the original Gillman specimen can, as regards its characters, be perfectly well understood as cospecific with the Indiana material, while its habitat is the same and location adjacent. But evidently the Indiana specimens represent the normal form of the species, and the type conception must therefore be as here defined. Nontypical features will then be: The elongation of the leaves of the sterile tufts (up to 20 and sometimes almost 30 cm.) and the sharpening of their apices, as shown in all the garden specimens, the deep, sharp toothing of the upper leaves, as shown in the largest Lake Superior specimen, the expansion of the panicle into a brush of slender branches, as shown chiefly in the specimen last mentioned, and in a measure the reduction of the thickness of the leaves. One of the Indiana plants, however, has the upper leaves pronouncedly serrate and there is considerable variation in the thickness of the leaves, the flat sand plant tending to have them thicker than the dune plant. The peculiarities of the garden plant being merely developmental do not require taxonomic notice.

Under this new light it is hardly possible to regard the lake sand plant as a subspecies; but in point of relationship *S. gillmani* is decidedly nearer to *S. randii* than it is to *S. racemosa*. From the latter it is separated by its more robust habit, fewer, broader, blunt, more coarsely and strongly reticulate leaves, and its rather larger heads with broader tegules, and by its arenicolous habitat. From *S. randii*

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[a] I beg leave to introduce this term in place of the cumbersome "bracts of the involucre." Latin *tegula, tegulae*, a roof tile, from root *teg-*, to cover.

it differs in being a distinctly taller and heavier plant with a glabrous stem and with still thicker and more coriaceous leaves which tend to expand into a rhombic-oval blade instead of a narrower oblong one and which are more coarsely and strongly reticulate, and in its larger heads with broader, more oblong (less tapering) tegules. *Solidago randii*, further, often has the inflorescence glutinous which is not apparently the case with *S. gillmani*. The distribution of the one on coastal sands and of the other upon ledges or earth in rocky and mountainous regions certainly affords a strong presumption of specific distinctness.

It remains to justify the use of this name. Inasmuch as Gillman seems to have been the first to take note of the species, and since the name *gillmani* has come into use for the normal plant in spite of the misleading description, it seems desirable to perpetuate it. The risk of misapplication I regard as very slight.

**Solidago harrisii** Steele, sp. nov.

Plant 30 to 80 cm. (said to be sometimes 150 cm.) high; stem assurgent, somewhat arcuate and flexuous, of ordinary thickness, smooth, finely striate; stem leaves not crowded, the larger mainly 10 to 20 cm. long, the blade broadly elliptical-ovate, 5 to 10 cm. long, 3 to 6 cm. broad, abruptly short-acuminate and laterally curved at the apex, below abruptly contracted into a broadly winged, cuneate petiole, "full" at the sinuses and commonly folded in pressing, the same less conspicuously the case at the base of the acumination, beneath, and less boldly above, showing two well-defined pairs of slender, rather prominent veins, a third pair less well defined, the intervals densely reticulate, each wing of the petiole with a pair of nerve-like veins carried down from above; succeeding leaves gradually smaller, becoming in the inflorescence lanceolate or nearly so with merely a narrowed base; leaves of the frequent sterile tufts numerous, similar to the lower stem leaves but often larger, their petioles, as also those of the lowermost stem leaves, frequently longer than the blades; all the leaves very coriaceous, thick, when young bright green and shining and with a suggestion of fleshiness, permanently lucid, slightly paler beneath, smooth except the hispidulous-scabrous margin; inflorescence pyramidal, one-sided, loose, the branches stiffly arcuate (not at all drooping), at least the branchlets and peduncles puberulent; heads near the extremity of the branches single, mostly, however, in racemules of three to five, these and the single heads secundly racemose, crowded but on the longer branches confined to the outer half; heads 5 to 6 mm. high; tegules coriaceous, the middle ones occasionally rather narrow and sharp, normally oblong or somewhat tapering above with a deltoid, ovate, or still more rounded tip, in the fresh state boat-shaped and with two green lines confluent under the apex, in the dry state still somewhat keeled and in variable degree blackish green above; rays about 5, 2 to 2.5 mm. long, elliptical in form, of a deep yellow; disk flowers 9 to 15; achenes strigose.

Type in the U. S. National Herbarium, no. 615507, collected at Cumberland, Maryland, June 20, 1910, by Edward Harris, on cliffs and hillsides of the Hamilton and Clinton shales. Five other specimens of this date were furnished by Mr. Harris besides 5 of June 14, 2 of July 9–16, and 8 of August 10 of the same year; also one from the same locality by J. E. Harned, September 12, 1910.

The other collections known are:

WEST VIRGINIA: Clayey Mountain (north of Sweetsprings), *E. S. Steele* 305, September 14, 1903.

VIRGINIA: Millboro, Bath County, *E. S. Steele*, September 6, 11, 19, 1906; August 21, September 17, 1907; Augusta Springs, Augusta County, *E. S. Steele*, August 29, 1908.

At the first of these localities, the plant occurred on clay at the base of the mountain; at Millboro, on clay at the base of shale hills and also on slopes of crumbling shale; at Augusta Springs, on shale at the base of Great North Mountain. The Clayey Moun-

tain soil, though not duly investigated, is doubtless a shale product, bearing as it does at a suitable station the characteristic *Oenothera argillicola* and *Eriogonum allenii*. These plants were also in their favorite positions at Millboro, but they were wanting at Augusta Springs, as were several other plants characteristic of the shales farther west.

The seasonal development of the flowers is evidently early but very protracted. As reported by Mr. Harris, they had already begun to appear in 1910 by May 28, and on a western exposure tall plants were little in bloom July 20. At Millboro in 1907 many heads were still bright August 21.

*Solidago harrisii* was collected and distinguished jointly by Mr. Harris and Prof. George M. Perdew of Cumberland, Maryland, having, as it proved, been earlier noted by myself. By an understanding satisfactory to all it is described and named as here.

My 1905 collection was referred doubtfully to *Solidago boottii* and was sent out, I think, under that name. After collecting the same at Millboro I recognized the distinctness of the species and gave it a manuscript name.

The species is doubtless akin to *S. boottii* in its coriaceous leaves and tegules, stiff habit, and recurved branches. It differs greatly from it in its more robust though typically depressed habit, much broader and more lucid leaves, more ample panicle, etc. It has the habit of a depressed and stiffened *juncea*, but is not near that species. Its closest alliance is probably with *S. arguta*, the relation being most obvious in the broadly dilated and sharply serrate leaf blades, the very distinctive nervation of the petiole wings being also imperfectly anticipated in *S. arguta*. It differs from that species, however, in its lower stature and broader panicle, in its shorter and more dilated leaves with less forward-pointing teeth, and with firmer texture, brighter surface, and much more broadly winged petioles, and in its smaller heads and commonly thicker tegules. There are various forms of *S. arguta* presenting a lower and stouter habit, or thicker, coriaceous leaves, or coriaceous tegules, or some combination of these features, but none of these infringe at all upon the specific rights of *S. harrisii*. *Solidago amplexicaulis* may also be mentioned on account of its similarly broad and broad-petioled leaves, these dilated-clasping, however, as is not the case in *S. harrisii*. The two species are otherwise remote.

**Solidago moritura** Steele, sp. nov.

Probably nearest *Solidago missouriensis;* spreading by running rootstocks and forming patches; stems assurgent at the base, more or less procumbent, slender, very smooth, even the inflorescence glabrous, finely striate; leaves numerous, all very narrow, oblanceolate-linear or above lanceolate-linear, the largest 10 to 13 cm. long and rarely 7 mm. broad, these situated about halfway up the stem, the lower a little shorter, the upper gradually reduced, 3 or 4 cm. long at the first developed branch, abortive branches in the upper axils; lower leaves insensibly narrowed into a long petiolar base, this upwardly slowly lost; all the leaves very sharply acuminate, entire or the larger with a few short, sharp teeth, glabrous save for the hispidulous margin, none triple-nerved, yet all showing below a fairly well-defined pair of straight lateral veins, merging above with the general strong reticulation; inflorescence very one-sided, soft and graceful, intensely yellow, based upon a penicillate-appearing cluster of slender, strongly ascending, branches, these bearing linear-filiform bracts, otherwise naked some distance before developing heads, the longest branches commonly 8 to 12 cm. long, sometimes reaching 20 cm. or reduced to 6 cm.; racemes secund, the lowest branchlets bearing commonly 2, but in strong plants sometimes 6 heads, a part occasionally abortive, all on filiform peduncles, the lateral subtended by filiform bractlets, the clusters soon succeeded by single heads on bracteolate peduncles, the lowest branchlets (including heads) 10 to 15 mm. long, the following successively shorter; heads oblong in section, including disk between 4 and 5 mm. long; tegules linear-oblong, slightly tapering, ovately narrowed, obtuse, golden but with a

moderately green looped midvein; florets not far from 20, 8 or 9 radiate; rays oval, scarcely 2 mm. long; achenes strigose.

Type in the U. S. National Herbarium, no. 648380, collected at Urbana, Illinois (Mount Hope Cemetery), August 10, 1910, by E. S. Steele. Only a single patch was seen, from which 18 stems were taken, perhaps as many more being left.

The species is named in allusion to the fact that it will soon be nearly or quite extinct. It has the advantage over some other species, however, that it completes its cycle early and produces seed prior to the ordinary railroad mowing time. The station is upon a high swell of ground and the plant need not be looked for in poorly drained situations.

*Solidago moritura* resembles *S. missouriensis* in the fundamental structure of the panicle, the presence of abortive branches, and the narrow tendency of the lower as well as the upper leaves. It differs in its weaker habit, its more slender and longer stems, its slender and pliable ascending (not recurved) branches, its long, filiform peduncles and bractlets and narrower tegules, and its much narrower and much less serrate leaves, and in the venation of its leaves, which want the sharp prominulous lines so noticeable in those of the latter species. Nor have I any information that *S. missouriensis* forms patches. By *S. missouriensis* I understand a species represented sparingly from Illinois but abundantly from the two tiers of States next west of the Mississippi, having the characters suggested by the comparison. An Illinois plant, of which several specimens were obtained on the same trip, has sometimes been called by this name, but is evidently either a form of *S. juncea* or a close ally of that species. The new species contrasts with everything of the *juncea* type by the non-expansion of its lower leaves, but in venation its leaves are better comparable with those of the form just referred to than with those of *missouriensis*. Our plant is also related to *S. serotina* and *S. rupestris*, as suggested particularly by the sharply acuminate leaves, but is shut off from them by the feeble development of the lateral pair of veins, also in a measure by its rather more xerophytic finish.

**Solidago sciaphila** Steele, sp. nov.

Stem 45 to 80 cm. long, typically stout but with more slender states, soft, smooth except for a scanty puberulence high in the inflorescence, striate, pale green or lightly purpled; leaves numerous, commonly ample but chiefly in breadth; lower leaves petioled, 10 to 15 cm. long, the blade either elliptical-obovate (this form including the largest states but also small ones), or not seldom rather rhombic-ovate, occasionally oblong, mostly 2.5 to 6 cm. broad, the apex forming in the rounder leaves a very obtuse angle and always a rather broad one, mucronate, below at first curvately narrowed, then cuneately decurrent on the petiole and extended as a margin quite to the base, there pilose-ciliate; succeeding leaves with the petioles successively shorter and soon replaced by a cuneate base, not greatly reduced in size up to the fifth or sixth, still 5 to 7 cm. long at the base of the inflorescence, thence gradually reducing as foliaceous bracts to the summit; all the leaves thin, not hard yet with a somewhat parchment-like finish, glabrous except the weakly hispidulous margin, or occasionally with scattered appressed hairs beneath, pale above, more so beneath, there lightly feather-veined and rather densely but not heavily impressed-reticulate; inflorescence loosely thyrsoid, in weak specimens composed of small axillary clusters, usually ample, the branches more or less lengthened, either uniformly or irregularly, or longer toward the base and thence gradually shortened, in vigorous specimens descending in reduced axillary clusters below the middle of the stem, normally occupying one-third or two-fifths of the stem, the ultimate racemules few-headed, symmetrical; heads campanulate, about 6 mm. long; tegules except the basal linear-oblong, elliptically rounded and obtuse at the summit, the medial ridges light green, forming a more or less distinct loop above, the green part showing a scurfy roughening or puberulence; flowers 15 to 17; rays about 5, elliptical-oblong, scarcely exceeding 2 mm. long, pale; achenes minutely strigose.

Type in the U. S. National Herbarium, no. 608749, collected at Kilbourn, Sauk County, Wisconsin, from shady cliffs of the Wisconsin River, August 26, 1909, by E. S. Steele (no. 42). Fourteen specimens, 10 of this date and number, were preserved, and 4 of no. 51, August 27. The plant is found in both the upper and the lower "Dells," in clefts and on shelves, and even in thin soil on top of the rock, but nowhere in the blaze of the sun and often in much shaded and damp situations.

The nearest relationship of *S. sciaphila* is doubtless with *S. gillmanii*, the likeness being most manifest in the forms with less expanded, rhombic-ovate leaves. The two species may well be conceived as having come from a common stock, *S. gillmanii* having adapted itself to endure strong insolation though with a good moisture supply, for it is not believed that even the dune sands are ever dry to any great depth; *S. sciaphila* having taken on the capacity to subsist without strong sunshine and perhaps with less soil moisture than *S. gillmani*, for there can hardly be much water in these clefts. The two agree in loving a siliceous substrate and enjoying the scent of fresh water. The occurrence of *S. sciaphila* on rock can not by itself be taken as proof of specialization, for common *S. nemoralis*, likewise *Vasiphora fruticosa*, and other ordinary plants, appear in crevices of the same rocks, though in exposed situations, while a dwarf state of *Lycopus communis* (or a species very close to that) becomes an abundant inhabitant of moist cliffs along with the genuine cliff dweller *Sullivantia sullivantii*. In the want of evidence to the contrary, however, the presumption is strong that our plant is, like Sullivantia, entirely confined to these situations. The difference in the adaptations of *S. gillmani* and *S. sciaphila* appears outwardly in the paler aspect, softer wood, thinner and much larger leaves, and the leaf-like bracts of the latter. Other details of specific difference could be pointed out if necessary.

**Aster choralis** Steele, sp. nov.

Forming patches by its slender, red purple rootstocks; stems percurrent, 75 to 100 cm. high, slender, leaning and somewhat arched, of a bright red purple, smooth save for a scanty puberulence high in the inflorescence; stem leaves sparse, excurved-spreading, the lower (wanting at flowering-time) 9 to 11 cm. long, with a slender margined petiole about as long as the blade, the following with shorter and broader petioles, these soon giving way to a cuneate basal segment and at least in the inflorescence lost entirely; base of the lower petioles little broader than the insertion; leaf blades oblong-ovate to ovate-lanceolate, apparently none cordate, distinctly acuminate, the margin incurved-serrate in the middle, firm, of medium thickness, dark green and scaberulous above, beneath paler, sparingly puberulent, rather distinctly feather-veined, densely reticulate; inflorescence little compounded, ovoid with an acutely conical summit, loose below, above more crowded; branches slender, usually somewhat curved, between spreading and ascending, the longest 12 to 20 cm., rarely 28 cm. long, only occasionally with secondary branches; peduncular branchlets fairly numerous, occupying the outer half of the longer branches or a larger part of the shorter ones, mainly 1 to 6 mm. long and bearing a single head, the longer with 1 to 5 bracteoles, the uppermost of these marked like a tegule; involucre campanulate, in the fresh plant well filled out below, 3 mm. high, in the pressed plant appearing 3.5 mm.; tegules in about 4 series, broadly linear with a deltoid or somewhat ovate apex, the lozenge-shaped green marking very heavy for the size of the head; rays oblong-oval, 4 mm. long, of a pale blue, near lavender; achenes with delicate strigose hairs.

Type U. S. National Herbarium no. 648481, collected at Oakland, Garrett County, Maryland, altitude 780 meters, September 19, 1910, by E. S. Steele.

A single patch of some 40 stems was found, from which 18 specimens were taken. The exact locality is the steep slope at the rear of the hotel south of the railroad station. The exposure is northern but the ground not shaded.

The affinity of *Aster choralis* is doubtless with *A. schistosus* and *A. lowricanus*, notwithstanding the roughness of the leaves, as testify the leaf form and texture,

the tegule characters, and the smooth stem. The leaf surfaces suggest *A. cordifolius*. Its smooth willowy stems set it widely apart from any species of the *undulatus* type. Besides the differences in leaf surface, it is a much more slender plant than *A. schistosus*, with no comparison in size of heads, and is a much lower plant than *A. lowrieanus* with smaller heads, while it differs from both in its wiry, arcuate stems and heavier tegule tips.

This is a pretty plant, and, growing as it does in companies, may be named as here in allusion to the choral dance.

**Aster schistosus** Steele, sp. nov.

Spreading by very slender branching rootstocks and forming small colonies; plant when best developed exceeding a meter high, mainly much lower and on dry bluffs sometimes flowering at a height of 15 cm.; stems assurgent, soon nearly erect, somewhat flexuous, lightly fluted, glabrous except for a few hairs in the inflorescence; leaves of the sterile tufts and some of the lower stem leaves with an ovate or sometimes oblong-ovate, moderately cordate blade on a margined petiole exceeding its own length; following leaves with the blade scarcely or not at all cordate, ovate, or ovate-oblong to ovate-lanceolate, sharply acuminate, the petiole in large specimens rather long and narrowly winged, widening toward the base or more often toward the blade, at length giving way to a broadly cuneate or oblong petiolar segment, this change in dwarf specimens taking place very promptly; margin of the blade serrate in the middle with appressed or sometimes slightly salient teeth; all the leaves rather thick, or when large thinner, not very firm, glabrous except the hispidulous margin; dull green above, beneath paler, pinnately veined, densely reticulate with dark lines, these in the dry plant obvious also above; inflorescence in large specimens ample, pyramidal or dome-shaped, the axis percurrent, zigzag, the branches mostly straight, the longer floriferous only on the outer half, the shorter for their whole length; branchlets mainly 1 to 2.5 cm. long, usually with a single developed head, but not seldom with minute abortive lateral heads, bearing several minute, subulate bracteoles; heads few or moderately numerous, 8 to 9 mm. high, the involucre broadly campanulate; tegules strict, of about 6 lengths, the lower oblong, the upper linear, the tip deltoid, scarcely thickened, the back white with a green line expanded above into a rhombus terminating with the tegule; rays 12 or 15, linear-spatulate, 8 or 9 mm. long, deep blue; achenes glabrous.

Type in the U. S. National Herbarium, no. 494524, collected at Millboro, Bath County, Virginia, September 17, 1907, by E. S. Steele. Six other specimens of this date were preserved, besides 10 of September 15, 1907, and 8 of September 16, 1906. All were from the region at the west end of the railroad tunnel.

The leaf form of this plant suggests affinity with *Aster prenanthoides* and *A. tardiflorus*, especially the latter, on account of the lack in both of a basal dilation of the petiole. The strict involucre, however, and the nonacuminate, diamond-marked tegules exclude it from this group and point unmistakably to relation with *A. lowrieanus* and its allies, with which also the leaves well accord. The middle stem leaves greatly resemble those of *A. lowrieanus lanceolatus*. Comparing with what seems to be the typical form of *lowrieanus*, viz, a rather low plant with ample broad, conspicuously cordate leaves, *A. schistosus* is stouter and stiffer with much drier, much smaller, and much less conspicuously cordate leaves and somewhat larger heads. The subspecies of *A. lowrieanus* are so much more tall and slender with so much smaller heads that in spite of the resemblance in leaf form mentioned above the relation is externally not at all close. No form of *A. lowrieanus*, as far as known, has a colony-making system of rootstocks. In *A. schistosus* this feature is quite noteworthy, notwithstanding the fact that the groups are small, only 5 flowering stems having been traced by me as belonging to the same system. The rootstocks are very slender and thread their way through the shale gravel of dry hills instead of the moist humus or mud of low meadows

where *Aster puniceus* and the like spread so vigorously. For comparison with *A. choralis*, see that species.

While a shale is not a "schist" in a geological sense, *schistosus*, as a Latin word, describes with sufficient accuracy the substratum upon which this species grows, and hence may well serve as its name.

**Silphium reniforme** Raf.; Nutt. Trans. Amer. Phil. Soc. n. ser. 7: 342. 1841.

This plant, referred in Small's Flora to North Carolina, proves to be a locally common Virginia species also. I first met it in 1903 on shale ground about a mile from Eagle Rock, Botetourt County. In 1906 and 1907 I found it common about Millboro, Bath County, on shale, sometimes on shale clay. The largest specimens seen were on the latter in a golden-rod and aster field, where it exceeded a man's head in height. It was seen also from a train on the Chesapeake and Ohio Railroad at a point between Covington and Allegheny. I think I saw a specimen on siliceous rock near Millboro, but it is doubtful if it ever wanders far from an argillaceous base.

The description is as in Small's Flora. The species is an obvious ally of *S. terebinthinaceum*, from which it differs in its lower leaves being spreading instead of erect, much smaller, and usually as broad as long or broader.

**Helianthus laevigatus reindutus** Steele, subsp. nov.

Often small but becoming fully as high as the type, more disposed to branch and sometimes quite bushy; lower internodes shortened, often several only 2 to 3 cm., or in stronger plants 4 to 5 cm. long, at least one or two of the lowest more or less densely papillose-hirsute, decreasingly so commonly up to the fourth or fifth; lower surface of the lower leaves, often as far up as the branches, very scabrous, higher becoming smooth, the upper surface little if at all roughened.

Type in the U. S. National Herbarium, no. 494565, collected by E. S. Steele at Millboro, Bath County, Virginia, September 1–17, 1906. On hills of crumbling shale and shale cliffs, common. Thirteen specimens, collected different days, were preserved.

This very pronounced form seems to prevail to the exclusion of the type on the shales of Bath County. A specimen clearly the same was obtained from the shale at the base of Great North Mountain, Augusta Springs, Augusta County, in 1908. A specimen collected by Heller and Halbach (no. 1185) from Elliott's Knob (Great North Mountain), the substratum not stated, has the lower surface of the leaves considerably scabrous. Other material collected by myself on siliceous ground of the same region is smooth.

*Helianthus laevigatus* is a familiar plant among the brush on stony ground of the Virginia mountains. As seen by me, it is not usually much branched, nor is the subspecies by any means always so. The internodes should be long, except one or two of the lowest. The stem should be essentially smooth, as also the leaves, except the margin. The tegules in both the type and the subspecies are very frequently prolonged into a slender rigid, revolute-margined, almost acicular tip.

The supposition is at least plausible that this subtype is a direct transformation of *H. laevigatus*, due to the special influences of the shale substratum. I hazard the guess that in spreading over the shale where the plant covering is exceedingly imperfect it found an indument on the base of the stem and the lower surface of the leaves advantageous as a protection from the reflected light and heat. In other situations, the vegetation is generally well closed up (except in deep shade, where this plant does not grow) and the want was not equally felt.

# TWO NEW SHRUBS FROM LOWER CALIFORNIA.

By Paul C. Standley and E. A. Goldman.

The following new species were detected by Mr. E. A. Goldman in the course of determining a large collection of plants made by Mr. E. W. Nelson and himself in Lower California during the winter of 1905–6. The descriptions, prepared jointly by Mr. Standley and Mr. Goldman, are here published in advance of a comprehensive report upon the biology of the peninsula, in course of preparation by the Biological Survey of the Department of Agriculture.

**Manihot chlorosticta** Standley & Goldman, sp. nov.

Shrub or small tree 3 to 6 meters high, half reclining; branches long and slender, glabrous and smooth; leaves 5-parted almost to the base; the three upper divisions 40 to 80 mm. long, 7 to 30 mm. wide, obovate and entire to rather narrowly panduriform and conspicuously undulate, acuminate at the apex, glabrous and of about the same color on both surfaces; the two lower lobes similar in outline, but only half as long; peduncles slender, 40 to 70 mm. long; fruit ovoid, 20 mm. long, 18 mm. thick, coarsely tuberculate, with thickened, coriaceous walls, on pedicels 30 to 70 mm. long; seeds broadly oblong, truncate at the apex, obtuse at the carunculate end, 13 mm. long and 8 mm. wide, pale drab with broad transverse olive-green splashes; caruncle trapeziform, 3.5 to 4 mm. in diameter.

Type in the U. S. National Herbarium, no. 565478, collected at San José del Cabo, Lower California, altitude about 15 meters, January 6, 1906, by E. W. Nelson and E. A. Goldman (no. 7401).

*Manihot chlorosticta* is a rather common species near the coast at San José del Cabo. It has been confused with *M. carthaginensis*, but that species occurs much farther south and has different leaves and seeds.

**Mesosphaerum insulare** Standley & Goldman, sp. nov.

A shrub 3 to 6 meters high, with widely spreading branches, the older ones brownish and glabrous, the younger finely tomentulose; leaf blades rather thick, oblong-orbicular, obtuse or retuse at the apex, rounded or somewhat narrowed at the base, 10 to 20 mm. long and of the same width, those of the inflorescence much reduced in size, tomentulose when young, becoming glabrous, the margins more or less sinuate; petioles slender, tomentulose; heads of flowers axillary on glabrous, reddish brown peduncles 13 to 15 mm. long; calyx about 6 mm. high, campanulate, the lobes narrowly triangular and half as long, densely lanate except on the calyx lobes, these only slightly lanate; corolla in form like that of *M. laniflorum*, the lobes narrower, not ciliate; nutlets cinnamon brown, smooth.

Type in the U. S. National Herbarium, no. 565559, collected on Espíritu Santo Island, Lower California, February 7, 1906, by E. W. Nelson and E. A. Goldman (no. 7503).

This is similar to *M. laniflorum*, but the leaves differ in outline, being obtuse or retuse at the apex instead of acute, and the margins are sinuate instead of dentate or serrate. The peduncles, besides, are stouter and the calyx lobes broader.

The species was observed to be common along the basal slopes of the rugged hills which form the high interior of the island.

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UNITED STATES NATIONAL MUSEUM

# CONTRIBUTIONS

FROM THE

# UNITED STATES NATIONAL HERBARIUM

VOLUME 13, PART 11

# THE ALLIONIACEAE OF MEXICO AND CENTRAL AMERICA

By PAUL C. STANDLEY

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# PREFACE.

The accompanying paper by Mr. Paul C. Standley, Assistant Curator in the United States National Herbarium, is an account of the Mexican and Central American plants of the family Allioniaceae. It follows a similar paper dealing chiefly with the representatives of the family in the United States, published in Volume XII of this series.

The present paper is the result of field work and of the study of material found in all the larger herbaria of this country. As in many other families of Mexican plants, the material of the Allioniaceae was found in a very confused state. The total number of representatives of the family reported from the region under discussion is 113, several of which are described here for the first time.

FREDERICK V. COVILLE,
*Curator of the United States National Herbarium.*

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# THE ALLIONIACEAE OF MEXICO AND CENTRAL AMERICA.

By Paul C. Standley.

## INTRODUCTION.

Only a short time has passed since the writer, at that time connected with the Agricultural College of New Mexico, published a paper upon the Allioniaceae of the United States with notes on Mexican species [a], but since that time he has had access to a large amount of material not then available. The Mexican and Central American collections in the National Herbarium were not included in those loaned him for study in the preparation of the earlier paper. These specimens are essential to a proper understanding of the southern members of the family, including as they do the extensive collections made in the region by Rose, Nelson, Goldman, Conzatti, Pittier, Tonduz, and many others that are not fully represented elsewhere. In addition it has been possible to examine all the material in the Gray Herbarium and in the herbaria of the New York Botanical Garden and Columbia College, Capt. John Donnell Smith, Dr. E. L. Greene, the Academy of Natural Science of Philadelphia, the Arnold Arboretum, and the University of Pennsylvania. These collections include a great many historic specimens, especially the Gray Herbarium, where are found the types of the many species described by Gray and Watson. Although supposed duplicate type specimens of most of the species had been seen, it was impossible to be absolutely certain upon some points without examining the actual types. Some of the collections in the herbarium of the New York Botanical Garden are particularly valuable in the study of any Mexican group, and the Panama plants collected by Sutton Hayes, most fully represented there, added several new members of the Allioniaceae to our North American flora, notably the genus Colignonia.

When the earlier paper was published the material accessible was not sufficient to warrant the study of certain tropical genera such as Neea and Pisonia, which are treated here for the first time from the standpoint of Mexico and Central America.

[a] Contr. Nat. Herb. **12:** 303–389. *pl. 28–43. f. 49–67.* 1909.

In the course of the study of these larger collections much interesting information has been obtained regarding the Allioniaceae of the United States. This will be published in a later paper.

During the spring of 1910 the writer in company with Dr. J. N. Rose spent three months botanizing along the west coast of Mexico in the States of Sonora and Sinaloa and the Territory of Tepic. Although the season was not the best for the collection of herbaceous plants, many Allioniaceae were obtained, among them two new species, one of Salpianthus and one of Boerhaavia. An excellent suite of specimens was secured of *Pisonia capitata*, a plant but poorly represented in herbaria and often confused with *P. aculeata*. These two species well illustrate the value of field work, for, while in the herbarium it is often difficult to separate them, when growing they are distinguishable at a glance by the color of their flowers and the appearance of their leaves. At Mazatlan the fruits of a species of Okenia were secured in abundance. These, although apparently known to the authors of the genus, had not been collected since the original collection and none were to be found in any herbarium. Guaymas, Sonora, was among the places visited. It is a locality of special interest to the student of the genus Boerhaavia, because from its vicinity were obtained the types of no less than four species, while at least six other species have also been collected there. Unfortunately the season was so dry that few of the species were found in a growing state, but the dead plants of the previous season were to be seen everywhere. Some time was spent at the town of Alamos, Sonora, the type locality for two species of the same genus, but strangely enough, although several numbers of Boerhaavia were collected, neither of these two was secured. One of the species was found in several other localities later. Of the Allioniaceae reported from the west coast of the Mexican mainland all were collected except *Boerhaavia alamosana* and *Salpianthus purpurascens*. The latter has been found in the vicinity of Culiacan, Sinaloa, but was not seen by the writer.

The material of some of the Mexican species is very scanty and emphasizes the need of more extensive collecting in that vast territory. Still less satisfactory is that from Guatemala and Costa Rica, while of the Allioniaceae of Nicaragua, Honduras, and Panama practically nothing is known. There is much to be learned of the group through careful exploration and field study, which will doubtless add many species to our list, especially among the shrubby and arborescent genera.

The only treatment of the Mexican and Central American Allioniaceae heretofore published is to be found in Hemsley's Biologia Centrali-Americana[a] issued in 1882. In that work 48 species are

[a] Botany, vol. 3, pp. 1–9.

listed as occurring within our limits. In the present paper, owing chiefly to the more extensive exploration of the area, this number has been increased to 113. Hemsley listed 14 genera, while here the number given is 22, this principally due to a different conception of generic limits but partly because of more abundant material.

## SYSTEMATIC TREATMENT.

**ALLIONIACEAE** Reichenb. Consp. Veg. 85. 1828.

*Nyctaginaceae* Lindl. Nat. Syst. ed. 2. 213. 1836.

Dr. Anton Heimerl[a] has proposed the following division of the Allioniaceae into groups. His treatment is most satisfactory, and since it gives one a good general view of the family it is reproduced here.

I. Pisoniae Heimerl. Embryo straight, the cotyledons slightly recurved; flowers unisexual or hermaphrodite, usually with evident remains of the organs of the aborted sex; perianth usually not differentiated into two parts, that of the pistillate flowers closing at the summit and enveloping the fruit or adhering to its summit. Shrubs or trees, often armed with thorns; leaves opposite.—Neea, Torrubia, Pisoniella, Pisonia.

II. Boldoeae Heimerl. Embryo strongly curved; flowers hermaphrodite; perianth inconspicuous, green, persisting scarcely changed in fruit, not differentiated into a distinct upper and lower part. Plants not armed with thorns, herbaceous, or suffrutescent at the base; leaves alternate.—Salpianthus.

III. Mirabileae Heimerl. Embryo strongly curved; flowers hermaphrodite; perianth corolla-like and showy, enlarged and enveloping the fruit, or more or less evidently differentiated into two parts, the lower of which adheres to and envelops the fruit, the other deciduous from or persistent upon its summit. Herbs; leaves usually opposite.

A. Colignoniinae Heimerl. Perianth not adhering to the wall of the fruit, but enlarged and enveloping it at maturity, of like consistency throughout, finally pear-shaped, closed above; fruit without mucilaginous glands; anther cells almost spherical; cotyledons nearly alike; embryo spherical. Herbs with opposite leaves.—Colignonia.

B. Bougainvilleinae Heimerl. Perianth not adhering to the wall of the fruit, but enlarged and enveloping it at maturity, of the same thick consistency throughout, the lower part enlarging and enveloping the fruit, the upper drying and adhering to its summit; anther cells spherical to reniform; cotyledons more or less dissimilar but neither abortive; embryo linear-oblong; fruit adnate to the bracts and falling with them. Thorny, woody vines with alternate leaves.—Bougainvillea.

C. Abroniinae Heimerl. Perianth evidently differentiated into two parts of different consistency, the upper part thin, salverform, deciduous, the lower thick, enlarging and forming wings or ribs which adhere to the fruit, without mucilaginous glands; stigma linear; anther cells oblong; embryo oblong or ellipsoidal, the inner cotyledon abortive. Herbs with opposite leaves.—Tripterocalyx, Abronia.

D. Boerhaaviinae Heimerl. Perianth evidently differentiated into two parts of different consistency, the upper part thin, deciduous, the lower thick, enlarging and persisting as a coat of the anthocarp, often containing mucilaginous glands; stigma spherical or hemispherical; anther cells almost spherical; embryo spherical, ellipsoidal, or obovoid, the inner cotyledon not abortive. Herbs with opposite leaves.—Okenia, Selinocarpus, Wedeliella, Nyctaginia, Allionia, Quamoclidion, Hesperonia, Mirabilis, Acleisanthes, Boerhaavia, Cyphomeris, Commicarpus, Anulocaulis.

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[a] Jahresb. Oberrealsch. Fünfhaus **23:** repr. 15–17. 1897.

## KEY TO THE GENERA.

Embryo straight; flowers mostly unisexual, sometimes hermaphrodite; shrubs or trees.
- Staminate perianth tubular to almost spherical; stamens included. (Stems unarmed)..... 1. NEEA (p. 382).
- Staminate perianth campanulate; stamens exserted.
  - Fruit fleshy, not glandular. (Stems unarmed). 2. TORRUBIA (p. 385).
  - Fruit dry and hard, bearing numerous glands along its angles.
    - Flowers hermaphrodite, umbellate; stems unarmed; low shrubs; stigma depressed-capitate ..... 3. PISONIELLA (p. 385).
    - Flowers unisexual, corymbose; climbing or erect tall shrubs, or trees; stems armed with thorns or unarmed; stigma penicillate..... 4. PISONIA (p. 386).

Embryo strongly curved; flowers hermaphrodite; plants herbaceous, or sometimes suffrutescent at the base.
- Perianth inconspicuous, green, persisting scarcely changed in fruit, not differentiated into a distinct upper and lower part. (Leaves alternate)..... 5. SALPIANTHUS (p. 391).
- Perianth corolla-like and showy, enlarged and enveloping the fruit, more or less evidently differentiated into two parts, the lower of which adheres to and envelops the fruit, the other deciduous from or persistent upon its summit.
  - Perianth not adhering to the wall of the fruit but enlarged and enveloping it at maturity.
    - Leaves opposite; herbs; embryo spherical; fruit not adhering to the bracts.... 6. COLIGNONIA (p. 394).
    - Leaves alternate; thorny, woody vines; embryo linear-oblong; fruit adnate to the bracts and falling with them. 7. BOUGAINVILLEA (p. 394).
  - Perianth evidently differentiated into two parts of different consistency, part persisting as a coat of the anthocarp. (Leaves opposite.)
    - Stigma linear; inner cotyledon abortive; lower part of the perianth without mucilaginous glands; anther cells oblong.
      - Wings of the fruit hyaline, completely encircling the fruit; flowers usually tetramerous; stamens 4. 8. TRIPTEROCALYX (p. 395).
      - Wings, when present, thicker and opaque, not completely encircling the fruit but interrupted above and below; flowers pentamerous; stamens 5 or more... 9. ABRONIA (p. 395).

Stigma spherical or hemispherical; inner cotyledon not abortive; lower part of the perianth often with mucilaginous glands; anther cells almost spherical.
Stamens 9 to 17; peduncles lengthening in age and penetrating into the earth.....10. Okenia (p. 396).
Stamens 1 to 5; peduncles slightly if at all elongated in age and not penetrating into the earth.
Anthocarp with 5 or fewer thin, scarious wings. (Perianth almost campanulate to salverform with a long tube; involucre of a few small and inconspicuous bracts).....11. Selinocarpus (p. 398).
Anthocarp never with thin, scarious wings.
Anthocarp lenticular, usually with lateral, incurved teeth. (Flowers in 3's surrounded by an involucre which is 3-parted almost to the base) .....12. Wedeliella (p. 399).
Anthocarp never lenticular nor with marginal teeth, usually obpyramidal or ellipsoidal.
Flowers in many-flowered heads surrounded by an involucre of distinct, lanceolate bracts. (Perianth salverform with a long tube; stamens long-exserted, usually 5).....13. Nyctaginia (p. 400).
Flowers not in many-flowered heads surrounded by an involucre of distinct bracts, usually 1 to 3 or sometimes 10 together, each flower subtended by 1 to several bracts or the bracts united.
Involucre gamophyllous.
Anthocarp constricted at the base, hence obovoid, prominently 5-ribbed; involucre enlarged and membranous in fruit. (Involucre 1 to 5-flowered; perianth campanulate or nearly so) .....14. Allionia (p. 401).
Anthocarp oblong or ellipsoidal, smooth or somewhat 5-angled, but never prominently 5-ribbed; involucre not noticeably enlarged in fruit.
Involucres 3 to 10-flowered. (Perianth with a long but thick tube)....15. Quamoclidion (p. 410).
Involucres 1-flowered.
Perianth campanulate; anthocarp smooth.....16. Hesperonia (p. 411).
Perianth salverform, often with a long and slender tube; anthocarp slightly 5-angled.....17. Mirabilis (p. 413).
Involucre polyphyllous (the bracts often unequal).

Flowers usually solitary; bracts persistent, herbaceous; anthocarp oblong or obovoid (truncate). (Perianth with a conspicuous, often very long, tube; stamens 5).....18. ACLEISANTHES (p. 417).
Flowers usually more than one, approximate, rarely solitary; bracts scarious, deciduous; anthocarp narrowed or constricted at the base.
Anthocarp with 5 or fewer angles or ribs (obpyramidal or clavate); perianth campanulate.....19. BOERHAAVIA (p. 418).
Anthocarp 10-ribbed or striate; perianth not campanulate.
Anthocarp asymmetrical (clavate, without conspicuous mucilaginous glands); flowers in racemes..... 20. CYPHOMERIS (p. 428).
Anthocarp symmetrical; flowers not in racemes.
Anthocarp clavate, with conspicuous stalked mucilaginous glands; flowers umbellate; plants with weak, reclining, or clambering stems often woody at the base; leaves scattered evenly along the stems.....21. COMMICARPUS (p. 428).
Anthocarp turbinate or biturbinate, without conspicuous stalked, mucilaginous glands; stems stout, erect, herbaceous; leaves mostly basal.....22. ANULOCAULIS (p. 430).

## 1. NEEA Ruiz & Pavon.

*Neea* Ruiz & Pav. Fl. Peruv. Chil. Prodr. 52. *pl. 9*. 1794.

Type species, *Neea verticillata* Ruiz & Pav.

The genus consists of about 30 species besides those described here. Two are found in the West Indies, the others in South America, principally in Brazil and Peru. One or two are known from Colombia.

Hemsley cites three plants of the genus from our region, none of them under a specific name. The three numbers cited are Sutton Hayes's 112 and 359 from Panama, and Linden's 1606 from Teapa, Tabasco. None of these has been seen in the preparation of the present paper. The specimen from Tabasco is likely to be one of the species described from Mexico, or possibly *N. psychotrioides*, while those from Panama should be either *N. psychotrioides* or undescribed species.

### KEY TO THE SPECIES.

Leaves tomentose beneath.....1. *N. fagifolia.*
Leave glabrous beneath.
Leaf blades 11 cm. wide or more, sharply caudate.....2. *N. pittieri.*
Leaf blades less than 7 cm. wide, not caudate.

Leaf blades large, 80 to 190 mm. long, elliptic-lanceolate or oblanceolate, slightly acuminate or attenuate at the apex. (Branches of the inflorescence comparatively stout).....3. *N. psychotrioides.*
Leaf blades smaller, 17 to 70 mm. long.
Staminate perianth appearing strigillose, almost spherical; leaf blades obtuse or acutish.....4. *N. sphaerantha.*
Staminate perianth viscid-puberulent, not appearing strigillose, oblong; leaf blades acute.
Leaf blades thin; petioles about 3 mm. long; peduncles 60 to 70 mm. long, slender....5. *N. tenuis.*
Leaf blades thick and leathery; petioles 4 to 10 mm. long; peduncles 15 to 30 mm. long, stout.....6. *N. choriophylla.*

**1. Neea fagifolia** Heimerl, Jahresb. Oberrealsch. Fünfhaus **23:** repr. 39. 1897.

Type locality, "America centralis, Nicaragua." Type collected at Granada by Oersted.

Young branches sparingly tomentulose, becoming glabrate, the internodes short, leafly at the apex; leaves opposite, elliptic-lanceolate, 42 to 57 mm. long, 22 to 28 mm. wide, attenuate at both ends, cuneately narrowed to a petiole 6 to 8 mm. long, shortly acuminate at the apex, the apex acutish, widest in the middle, above shining and almost glabrous, below densely tomentose, thin; inflorescence on a slender peduncle 20 to 30 mm. long, shortly pyramidal, the branches slender; perianths sessile or on very short pedicels, ellipsoidal, 5 mm. long, shortly but distinctly attenuate at both ends, with 5 acute teeth at the mouth, glabrous; stamens 6, unequal, half as long as the perianth.

The writer has seen no material of this species. The description is adapted from that of Doctor Heimerl.

**2. Neea pittieri** Standley, sp. nov.

Branches stout, roughened, glabrous; leaf blades ovate to elliptic-oblong, 17 to 24 cm. long and 11 to 13 cm. wide, sharply caudate at the apex, with a narrowly triangular and very acute tip 15 to 20 mm. long, rounded or obtuse at the base and somewhat unequal, glabrous, thin, with conspicuous lateral veins, on a petiole 10 to 16 mm. long; inflorescence an open corymb 11 cm. broad, with stout, divaricate, puberulent branches, on a stout peduncle 7 cm. long; staminate flowers about 9 mm. long, tubular or ellipsoidal, with 5 ovate, acuminate teeth at the mouth, on pedicels about 2 mm. long; stamens 5 to 10, very unequal, the longest filaments 4.5 or 5 mm. long, glabrous, anthers 1.5 to 2 mm. long.

Type in the U. S. National Herbarium, no. 578028, collected on the mountains about the Valley of Tuís, Costa Rica, at an altitude of 1,000 meters, by Mr. H. Pittier (no. 16097). The very large and wide leaves with their caudate apices are very different from those of any of the other species treated here, while the flowers are considerably larger.

**3. Neea psychotrioides** J. D. Smith, Bot. Gaz. **16:** 199. 1891.

Type locality, "Escuintla," Guatemala.

*Specimens examined:*

GUATEMALA: Escuintla, alt. 330 meters, March, 1890, *J. D. Smith* 2069 (type); same locality, April, 1892, *J. D. Smith* 2474; Rio Ocosito, Depart. Quezaltenango, alt. 75 meters, April, 1892, *J. D. Smith* 1475; Cubilquitz, Alta Verapaz, alt. 350 meters, July, 1907, *Tuerckheim* 616; Cubilquitz, June, 1902, *Tuerckheim* 8280; same locality, July, 1903, *Tuerckheim* 8449.

COSTA RICA: Forêts de Tsaki, Talamanca, alt. 200 meters, April, 1895, *Tonduz* 9581.

HONDURAS: San Pedro Sula, Depart. Santa Barbara, alt. 240 meters, September, 1888, *Thieme* 5423.

This appears to be a most variable species in the size of the staminate perianth and in the form of the inflorescence; there is considerable variation in the leaf outline as well. The material cited possibly represents more than one species, but if so they are so closely related that with such insufficient material it seems unwise to attempt to separate them.

Closely related to *Neea psychotrioides*, but apparently distinct, is a specimen collected by John Hart at Bocas del Toro, Panama (no. 168). It may be a South American species.

**4. Neea sphaerantha** Standley, sp. nov.

Branches slender, grayish, smooth, glabrous; leaf blades oblong or oval to elliptic-oblong, 17 to 53 mm. long and 9 to 20 mm. wide, thin, glabrous, obtuse or acutish at the apex, rounded or broadly cuneate at the base, on slender petioles 4 to 10 mm. long; inflorescence a rather open corymb with but few branches, 40 mm. broad or less, on a slender glabrous peduncle 22 to 40 mm. long; branches of the inflorescence glabrous or sparingly puberulent, the bractlets thick and mostly lanceolate; staminate flowers almost spherical, 4 to 5 mm. long, about 3.5 mm. wide, short-pediceled, nervulose (appearing minutely strigillose), obscurely 4-toothed at the apex; stamens 6, unequal, slightly more than half as long as the perianth; pistillate flowers and fruit not seen.

Type in the Herbarium of the Field Museum of Natural History, no. 278505, collected at Izamal, Yucatan, by G. F. Gaumer (no. 697). A most distinct species in its nervulose perianths and obtuse or only acutish leaf blades which are not so much narrowed at the base as in the related species. What appear under a low-power lens to be minute appressed hairs are really minute, light-colored nerves.

**5. Neea tenuis** Standley, sp. nov. PLATE 74.

Branches slender, smooth, brownish, glabrous; leaves opposite in pairs or verticillate in 4's, the blades lanceolate-elliptic, 44 to 50 mm. long and 14 to 19 mm. wide, attenuate at the apex, acutish at the base, thin, glabrous, on petioles 3 mm. long; inflorescence a loose corymb, the branches very slender, almost capillary, flexuous, glabrous or with a sparse, appressed, rufescent pubescence, about 35 mm. high and 40 mm. wide; peduncles very slender, glabrous, 60 to 70 mm. long; bractlets subulate; staminate perianth 3 to 4 mm. long, oblong, glabrous or nearly so; stamens 6, one-third as long as the perianth, the filaments unequal; pistillate flowers and fruit not seen.

Type in the Gray Herbarium, collected by Botteri about Orizaba, State of Veracruz, Mexico. From *N. psychotrioides* the plant differs in its smaller leaves on short petioles, slender branches, and long and very slender peduncles.

The photograph is of the type sheet.

**6. Neea choriophylla** Standley, sp. nov.

Branches stout, pale grayish or brownish, smooth and glabrous; leaf blades elliptic-oblong, thick and leathery, glabrous, 45 to 70 mm. long and 20 to 30 mm. wide, acuminate, the tips being 7 to 15 mm. long, broadly cuneate at the base, on stout petioles 4 to 10 mm. long; inflorescence a narrow, rather compact corymb 20 mm. broad or less, on a glabrous or puberulent peduncle 15 to 30 mm. long; branches of the inflorescence rufescent-puberulent, stout; bractlets narrowly triangular, minute, 3 or 4 at the base of each flower; pistillate flowers tubular, 3 mm. long or less, minutely and sparingly puberulent, 4-toothed at the apex; stigma fimbriate, the style slightly exserted; staminate flowers not seen.

Type in the U. S. National Herbarium, no. 571766, collected in Yucatan by G. F. Gaumer (no. 761). The very thick leaves of this plant are strikingly different from those of any other species treated here, although they suggest those of some of the South American species. The leaf outline, too, is very different from that of the related species.



NEEA TENUIS STANDLEY.

## 2. **TORRUBIA** Vell.

*Torrubia* Vell. Fl. Flum. 139. 1825.

Type species, *Torrubia opposita* Vell.

The genus is represented in the West Indies by a number of species. Representatives are found in various parts of South America as well. Hemsley did not recognize Torrubia as distinct from Pisonia, but he cited *Pisonia pacurero*, properly a member of this genus, from Guatemala. That species is a Venezuelan one and the writer has seen no Central American material that could be referred to it.

**1. Torrubia costaricana** Standley, sp. nov.

A small tree; twigs slender, greenish gray, smooth and glabrous; leaf blades elliptic or narrowly oblanceolate, 80 to 110 mm. long and 20 to 34 mm. wide, dull green, glabrous, long-acuminate at the apex, tapering at the base to a slender petiole 5 to 10 mm. long; staminate inflorescence rather densely corymbose, 25 to 35 mm. wide, on a slender, almost glabrous peduncle 25 to 30 mm. long; perianth narrowly campanulate, 2 mm. long, almost glabrous, on a stout, puberulent pedicel; stamens 5, twice as long as the perianth; pistillate inflorescence and fruit not seen.

Type in the herbarium of Capt. John Donnell Smith, collected in the forests about Nicoya, Costa Rica, in May, 1900, by A. Tonduz (no. 13927). The collector states that the perianth is white and that the flowers are fragrant. The species is related to *Torrubia inermis*, but the very different leaves alone are sufficient to distinguish it.

## 3. **PISONIELLA** Standley, gen. nov.

*Pisonia* section *Pisoniella* Heimerl, in Engl. & Prantl, Pflanzenfam. **3**[1b]: 29. 1889.

Low shrubs with numerous forking or rarely opposite branches; leaves entire, petioled, opposite; inflorescence of numerous axillary, long-peduncled, many-flowered umbels; flowers hermaphrodite, narrowly campanulate; stamens 6 to 8, exserted; style depressed-capitate; perianth enlarging in age and becoming hardened and leathery, inclosing the fruit, becoming 5-angled and producing from each angle a row of papillose, viscous glands.

Type species, *Boerhaavia arborescens* Lag.

Although originally described as a species of Boerhaavia the type of the genus has usually been placed in the genus Pisonia, to which it is more closely related. The fruit is very similar to that of Pisonia, but the inflorescence, the style, and the habit of the plant are very different. Several times the type species has been described under the genus Boerhaavia. It does possess certain relationships with *Commicarpus scandens*, that being, no doubt, of the group to which it was referred. The fruit, however, is such as to exclude the plant from the genus Commicarpus. Unfortunately it has been impossible to get mature fruit of either species to determine the form of the embryo. It is to be expected that it will be straight or but slightly curved as in the species of Pisonia.

### KEY TO THE SPECIES.

Stems and leaves puberulent and more or less glandular; leaf blades short-acuminate, rounded at the base or subcordate.. 1. *P. arborescens.*

Stems and leaves glabrous; leaf blades long-acuminate, attenuate or acuminate at the base. (South America.) ..... *P. glabrata.*

**1. Pisoniella arborescens** (Lag. & Rodr.) Standley.

*Boerhaavia arborescens* Lag. & Rodr. Ann. Cienc. Nat. **4:** 257. 1801.

*Pisonia hirtella* H. B. K. Nov. Gen. & Sp. **2:** 217. 1817.

*Boerhaavia octandra* S. Wats. Proc. Amer. Acad. **26:** 145. 1891.

Type locality, "Salvatierra," Guanajuato, Mexico.

*Specimens examined:*

OAXACA: Valley of Oaxaca, alt. 1,560 to 2,040 meters, October 2, 1894, *Nelson* 1515; Oaxaca Valley, alt. 1,500 meters, November 7, 1894, *C. L. Smith* 790; Tlacolula et San Dionicio, August 4, *Andrieux* 128; Etla, September 19, 1895, *L. C. Smith* 798.

MEXICO: 1844, *Galeotti* 587; Guadalupe, Valley of Mexico, August 24, 1903, *Rose & Painter* 6535; Guadalupe, October 11, 1861, *Bourgeau* 518; Cerro de Guadalupe, alt. 2,250 meters, September 15, 1903, *Pringle* 11697; Chapultepec, February, 1903, *Purpus* 58; near the city of Mexico, *Bustamente y R.;* 1838, *Vischer;* City of Mexico, *Bilimek* 197; Valley of Mexico, *Schaffner* 184; Ixtepeji, October, 1844, *Galeotti* 587.

HIDALGO: Banks and ledges, Dublán, alt. 2,040 meters, September 16, 1902, *Pringle* 11142; Coxcatlan, September, 1909, *Purpus* 4210.

QUERÉTARO: Near Querétaro, August, 1906, *Rose & Rose* 11151; Querétaro, November 21, 1827, *Berlandier*.

VERA CRUZ: Orizaba, 1853, *Müller* 913.

GUANAJUATO: Ravine near Guanajuato, 1891, *Dugès* 299.

JALISCO: Rocky banks of river, Falls of Juanacatlan, October 2, 1891, *Pringle* 3879.

In Central Mexico the shrub is known by the common name of *jazmincillo*, possibly because of the resemblance of the whitish flowers open at night to those of some of the jasmines.

Here may be introduced for convenience a related South American type:

PISONIELLA GLABRATA (Heimerl) Standley, sp. nov.

*Pisonia hirtella glabrata* Heimerl, Ann. Cons. Jard. Genève **5**: 196. 1901.

Type locality, "Sorata," Bolivia.

*Specimens examined:*

BOLIVIA: Vicinity of Cochabamba, 1891, *Bang* 1063; without definite locality, *Bang* 1809; Sorata, alt. 2,400 meters, February, 1886, *Rusby* 2500.

ARGENTINA: Sierra de Tucuman, February, 1874, *Lorentz & Hieronymus* 776.

This, the only other species of the genus, is well differentiated from *P. arborescens* by its lack of pubescence and its different leaves. The two species occupy distinc areas, neither being known to occur in the southernmost part of Mexico, in Centra America, or in any of the intervening countries of South America.

## 4. PISONIA L.

*Pisonia* L. Sp. Pl. 1026. 1753.

*Calpidia* Du Petit-Thou. Veg. Isles Austr. Afr. 37. *pl. 10*. 1806.

*Pallavia* Vell. Fl. Flum. 151. 1825.

*Tragularia* Koen.; Roxb. Fl. Ind. 217. 1832, as synonym.

Type species, *Pisonia aculeata* L.

The type species of Pallavia is *Pisonia aculeata*.

The genus as generally understood is a rather large one, its representatives being found in various parts of North and South America, the West Indies, Africa, Asia, and Australia, as also on many of the islands of the Pacific. It consists of several well-defined groups, some of which deserve generic rank. Torrubia, which has been here included, was restored by Dr. N. L. Britton several years ago.

### KEY TO THE SPECIES.

Staminate flowers very narrowly campanulate, 5 mm. long (subcapitate)..... 1. *P. donnellsmithii*.

Staminate flowers broadly campanulate, 3 mm. long or less.

Anthocarp 14 to 20 mm. long, the glands along its angles in more than one row..... 2. *P. macranthocarpa*.

Anthocarp 7 to 14 mm. long, the glands in a single row.
Staminate inflorescence with 10 flowers or fewer; peduncles 2 or more together..... 3. *P. fasciculata.*
Staminate inflorescence with numerous flowers, the peduncles solitary.
Staminate flowers in compact corymbs 10 to 22 mm. in diameter, dark red.
Leaves broadly rounded or obtuse, orbicular or obovate, usually densely pubescent on both surfaces; spines mostly curved.. 4. *P. capitata.*
Leaves acute or acutish, oblanceolate, mostly glabrous; spines straight..... 5. *P. flavescens.*
Staminate flowers in loose, open corymbs 25 to 60 mm. broad; flowers yellowish green.
Leaves not oblanceolate, 25 to 85 mm. long... 6. *P. aculeata.*
Leaves oblanceolate, 110 to 150 mm. long..... 7. *P. grandifolia.*

**1. Pisonia donnellsmithii** Heimerl in herb.

Branches stout, yellowish, unarmed, glabrous or the youngest sparingly pubescent, densely leafy; leaf blades bright green, thin, elliptic to oblanceolate, 30 to 55 mm. long, 12 to 28 mm. wide, acutish or acute, cuneate at the base, glabrous except on the principal veins, there tomentulose, on tomentulose petioles 4 to 8 mm. long; staminate flowers subumbellate, the heads 2 cm. broad or less, the flowers on short viscid-puberulent pedicels 1 mm. long or less; peduncles 22 to 30 mm. long; perianth 5 mm. long, very narrowly campanulate, minutely puberulent without, 5-lobed at the mouth, the lobes obtuse; pistillate flowers and fruit not seen.

Type in the U. S. National Herbarium, no. 1810, collected at Los Verdes, Department of Amatitlan, Guatemala, at an altitude of 1,050 meters, October, 1893, by Heyde & Lux (no. 6301).

The species was given this name by Doctor Heimerl in the National Herbarium and has been used by him in correspondence but, apparently, has never been published. The plant can not well be compared with any other species of the genus, its dense inflorescence and peculiar perianth setting it off from all the rest. Possibly, when the fruit and pistillate flowers are known it will be found that it does not belong in the genus Pisonia. The specimens were distributed as *Pisonia macranthocarpa*, it being believed that they represented the staminate inflorescence of that plant. The mere form of the leaves should make such a view untenable and besides this the writer has seen reliable staminate material of *P. macranthocarpa* elsewhere, showing it to be far different from these specimens.

**2. Pisonia macranthocarpa** J. D. Smith, Bot. Gaz. **20:** 293. 1895.
*Pisonia aculeata macranthocarpa* J. D. Smith, Bot. Gaz. **16:** 198. 1891.
*Pisonia aculeata pedicellaris* Griseb.; Heimerl, Bot. Jahrb. Engler **21:** 633. 1896.
*Pisonia pedicellaris* Griseb.; Heimerl, Jahresb. Oberrealsch. Fünfhaus **23:** repr. 32. 1897.
Type locality, "Escuintla," Guatemala.

*Specimens examined:*
NICARAGUA: 1853–56, *C. Wright.*
COSTA RICA: Environs de Nicoya, December, 1900, *Tonduz* 13783; pâturages de Nuestro Amo, llanos de Turrúcares, January, 1902, *Pittier* 1522, alt. 700 meters.
GUATEMALA: Escuintla, Depart. Escuintla, alt. 330 meters, April, 1890, *J. D. Smith* 2091, type; same locality, alt. 330 meters, February, 1892, *J. D. Smith* 1230; Aguascalientes, Depart. Santa Rosa, January 24, 1908, *Kellerman* 7077; Paso de Lelha, Valley of Copan, alt. 550 meters, January, 1907, *Pittier* 1819; vicinity of Zacapa, Depart. Zacapa, alt. 200 to 400 meters, 1906–7, *Pittier* 1734a.

SALVADOR: 1905, *Renson* 241

MEXICO: Near Llano Grande, Providencia, Chiapas, December 13, 1906, *Collins & Doyle* 72.

The plant is said to be a small thorny tree with greenish flowers. It differs from *P. aculeata* in its much larger fruit and usually straight spines. The leaves, too, are more narrowed at the base and the petioles more or less margined. The branches are a deep reddish brown, while in *P. aculeata* they are usually much paler or even grayish. *P. pedicellaris* was based upon Cuban specimens; the species is found in Jamaica as well. Some of the Cuban specimens have the spines curved, but the Central American specimens seem to have them uniformly straight.

**3. Pisonia fasciculata** Standley, sp. nov.

Branches reddish or yellowish, smooth and glabrous, armed with few rather stout, straight spines 3 or 4 mm. long; leaf blades elliptic, acute, 35 to 40 mm. long, tapering at the base to closely puberulent petioles 4 or 5 mm. long; staminate flowers in 5 to 10-flowered clusters, subumbellate, the cluster 1 cm. or less in diameter, on a slender, viscid peduncle 12 mm. long, 2 to 5 clusters in an axil; perianth 2 to 3 mm. long, narrowly campanulate, minutely glandular-puberulent, almost sessile; stamens 5, exserted 2 or 3 mm.; pistillate flowers and fruit not seen.

Type in the U. S. National Herbarium, no. 45190, collected in Nicaragua by Charles Wright, 1853 to 1856. There is a sheet of the same collection in the Gray Herbarium.

The subcapitate inflorescence and the occurrence of more than one peduncle at a node readily distinguish this species.

A specimen in the Gray Herbarium collected at Gualán, Guatemala, at an altitude of 125 meters, January 15, 1905, *Deam* 270, seems to be the same. This specimen has no spines and the flowers are more nearly sessile. The collector says that it is a tree 15 feet high.

**4. Pisonia capitata** (S. Wats.) Standley. PLATE 75, B.

*Cryptocarpus ? capitatus* S. Wats. Proc. Amer. Acad. **24:** 71. 1889.

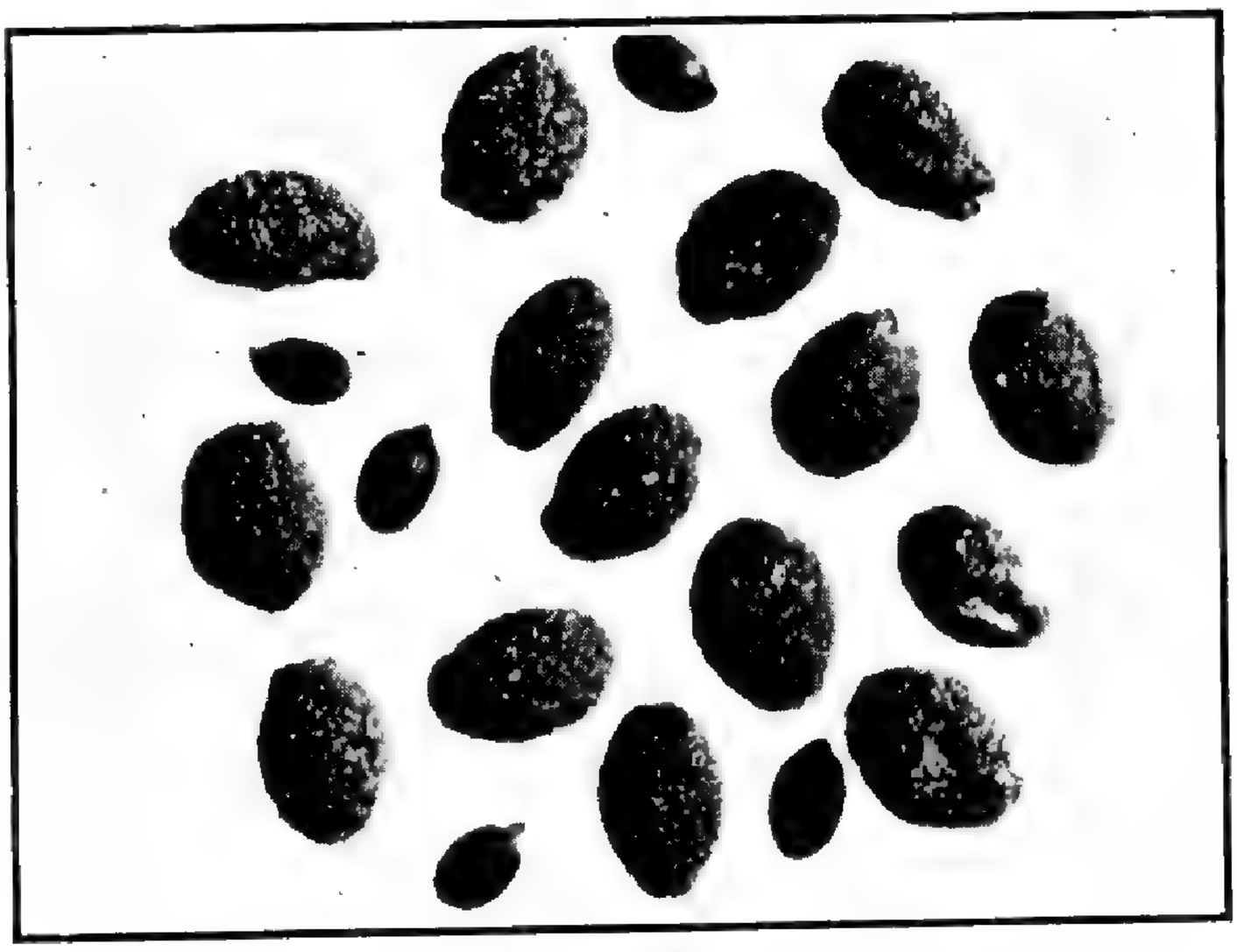
Type locality, "Near Guaymas," Sonora.

A low, densely branched shrub or small tree, 5 meters high or less, the branches often weak and clambering or spreading, armed with numerous stout, curved, or rarely straight spines 7 to 14 mm. long; older branches glabrous, grayish or yellowish, the younger ones densely pubescent; leaf blades orbicular to obovate, 20 to 60 mm. long, broadly rounded at the apex, rounded or tapering at the base, yellowish green, on petioles 6 to 16 mm. long; staminate flowers wine red, very fragrant, in dense corymbs 10 to 18 mm. in diameter, these not at all dissected but compact; staminate perianth 2 to 3 mm. long, with 5 obtuse lobes, densely viscid without; stamens 5, exserted 2 or 2.5 mm., the anthers conspicuous, buff; pistillate flowers in loose corymbs 10 to 18 mm. broad on peduncles 18 to 20 mm. long, tubular, reddish, densely viscid; style exserted about 1 mm., the stigma fimbriate; anthocarp prismatic, about 10 mm. long, rounded at the apex, narrowed near the base, the angles each with a single row of glands, the sides puberulent, the fruits arranged in a loose corymb 6 cm. or less in diameter, the branches viscid-pubescent.

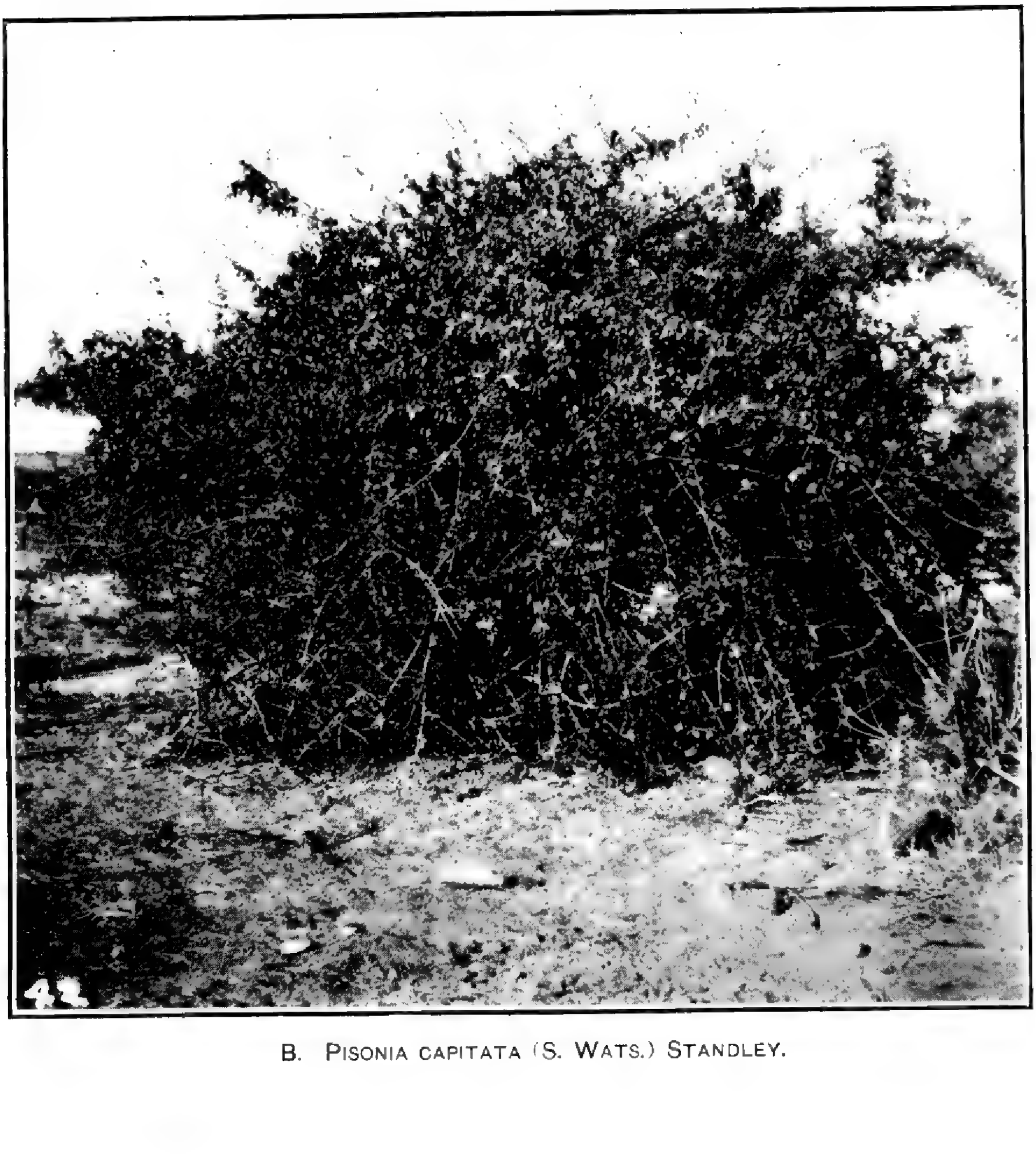
*Specimens examined:*

SONORA: Guaymas, February 17, 1890, *Palmer* 175; Alamos, January 26, 1899, *Goldman* 298; Guaymas, April 1 and 2, 1891, *Palmer* 1759; near Navojoa, March 21, 1910, *Rose, Standley & Russell* 13144; near Los Ranchos, vicinity of Guaymas, April 23, 1910, *Rose, Standley & Russell* 15032; along an arroyo in hills beyond the railroad station, Alamos, March 16, 1910, *Rose, Standley & Russell* 12924; Guaymas, 1887, *Palmer* 647, type; Guaymas, June, 1897, *Rose* 1264.

SINALOA: Road from Culiacan to Las Flechas, February 21, 1899, *Goldman* 314; near Bacubirito, March 12, 1904, *Wm. Palmer* 1250; along an arroyo near San



A. FRUIT OF OKENIA HYPOGAEA SCHLECHT. & CHAM.



B. PISONIA CAPITATA (S. WATS.) STANDLEY.

Blas, March 22, 1910, *Rose, Standley & Russell* 13213; thickets near Villa Union, April 2, 1910, *Rose, Standley & Russell* 13896; thickets east of Mazatlan, April 1, 1910, *Rose, Standley & Russell* 13847; dry thickets near Rosario, April 14, 1910, *Rose, Standley & Russell* 14519; Mazatlan, 1902, *Purpus;* Rosario, June 20, 1897, *Rose* 1407.

TEPIC: Moist arroyo near Acaponeta, April 10, 1910, *Rose, Standley & Russell* 14317.

The most striking difference between this species and *Pisonia aculeata*, at least in the field, is the very different color of the flowers; those of that species are yellowish green, while those of *Pisonia capitata* are a deep red. The latter is a very handsome shrub, at least as to the staminate plant, while the flowers of *P. aculeata* are inconspicuous and scarcely noticeable against the leaves. The leaves of the two are different as well, those of *aculeata* being usually smooth, rather fleshy, and shining, while those of *capitata* are pubescent, of a yellowish green cast, not at all fleshy, and never shining. The two are somewhat different in habit as well.

The writer in the spring of 1910 visited the type locality of the species near Guaymas. This is the northern limit of its range and only a few individuals were to be seen. These were stunted and not typical of the species. They were growing in a sandy arroyo not far from the coast at Los Ranchos about 5 or 6 miles from Guaymas. Farther south the plant was observed in abundance. It was frequent in the hedges about towns, along arroyos, and in the dense thickets so characteristic of the vegetation of the west coast of Mexico. At Alamos the common name was given as *garrambullo*, and the fruits were said to be used to make a decoction for treatment of fever.

The photograph was taken at Alamos, Sonora, by E. A. Goldman.

**5. Pisonia flavescens** Standley, sp. nov.

Older branches dark gray, smooth, the younger ones brown or grayish; spines few, stout, straight, 6 to 7 mm. long; leaf blades oblanceolate, 40 to 65 mm. long, obtuse or usually acutish, attenuate to the base, almost glabrous, traces of pubescence sometimes persisting along the veins, yellowish green, on slender petioles half as long as the blades; staminate flowers in dense capitate corymbs 10 mm. in diameter or less, these on peduncles less than 10 mm. long and somewhat puberulent; perianth broadly campanulate, the diameter greater than the length, obtusely lobed, sparingly puberulous, not glandular; pistillate flowers not seen; anthocarp 10 mm. long, 5-angled, almost glabrous, each angle beset with a row of low and inconspicuous glands.

Type in the Herbarium of the University of California, no. 101930, collected at San José del Cabo, Baja California, in May, 1897, by Mr. T. S. Brandegee. This specimen consists of both flowering and fruiting branches. On the same sheet are flowering branches gathered by the same collector at the same locality in March, 1892. There is a sheet of the type collection in the herbarium of the New York Botanical Garden and a fragment in the National Herbarium. A fragment of the second collection is also to be found in the National Herbarium.

The proposed species is nearest *Pisonia capitata* but differs in its oblanceolate, acutish leaves and the much smaller heads of staminate flowers.

**6. Pisonia aculeata** L. Sp. Pl. 1026. 1753.

*Pallavia aculeata* Vell. Fl. Flum. 151. 1825.

*Tragularia horrida* Koen.; Roxb. Fl. Ind. **2:** 217. 1832, as synonym

*Pisonia monotaxadenia* Wright & Sauv. Fl. Cub. 137. 1873.

Type locality, "In America meridionali."

*Specimens examined:*

YUCATAN: 1896, *Valdez* 57; 1895, *Millspaugh* 305; Uxmal, *Caec. & Ed. Seler* 3881; Merida, 1865, *Schott* 143.

TABASCO: Comun en los bosques del camino de San Juan Bautista à Atasta, March 14, 1888, *Rovirosa* 127.

VERA CRUZ: Orizaba 1855, *Müller* 1245 and 1370.
TAMAULIPAS: Vicinity of Victoria, alt. 320 meters, February to April, 1907, *Palmer* 137.
MICHOACAN or GUERRERO: Rives du Rio Coyaquilla, alt. 150 meters, February 6, 1899, *Langlassé* 833.
MEXICO: Valle de Córdoba, 1866, *Bourgeau* 2063.
OAXACA: Tuchitan, January 30, 1896, *Caec. & Ed. Seler* 1980; Cuicatlan, February 2, 1895, *L. C. Smith* 503; Oaxaca, 1896, *Caec. & Ed. Seler* 1620.
COLIMA: Colima, January and February, 1891, *Palmer* 1114; Acapulco, 1894–5, *Palmer* 404.
SINALOA: Along the edge of sand dunes north of Mazatlan, April 4, 1910, *Rose, Standley & Russell* 14000; thickets along the river, Guadalupe, April 18, 1910, *Rose, Standley & Russell* 14779.
TEPIC: Moist arroyo near Acaponeta, April 10, 1910, *Rose, Standley & Russell* 14318; south of Acaponeta, April 11, 1910, *Rose, Standley & Russell* 14416; San Blas, 1897, *Maltby* 28.
JALISCO: Roadside between San Sebastian and Las Palmas, alt. 150 to 750 meters, March 30, 1897, *Nelson* 4128.
COSTA RICA: Nicoya, 1896, *Cooper* 10384; forêts de Shirores, Talamanca, alt. 100 meters, February, 1895, Tonduz 9181.
GUATEMALA: Panzal, Baja Verapaz, 1907, *Tuerckheim* 1710.
HONDURAS: Rio Permejo, Santa Barbara, 1887, *Thieme* 5425.

The following specimens are noteworthy because of their leaves, which are densely pubescent beneath while usually very broad and obtuse; the young branches, too, are strongly pubescent:

OAXACA: Roadside between Llano Grande and Pinotepa, alt. 60 to 150 meters, February 19, 1895, *Nelson* 2342.
GUERRERO: El Limon, April 3, 1903, *Nelson* 6980.
MEXICO: Valle de Córdoba, March 14, 1866, *Bourgeau* 2063.
SINALOA: Road from Las Flechas to La Rostra, February 22, 1899, *Goldman* 320.
GUATEMALA: Naranjo, Depart. Escuintla, alt. 90 meters, March, 1892, *J. D. Smith* 2761.

Of all the species of Pisonia no other has so wide a range as this. In Mexico and Central America it is common in the warmer parts, usually occurring near the sea or along moist river bottoms. It is found in Florida, in most of the islands of the West Indies, in South America, in southern Asia, in the Philippine Islands, and in other islands of the Pacific. In some of these places it is thought to be introduced; especially is this probable in the case of the Philippines. Chance introduction is easy, for the viscid fruits attach themselves so readily to any object which touches them that they may easily be transported, either upon the bodies of animals or in packing or grain. The glands of the fruit maintain their viscidity for a long time, the fruit in some of the herbarium specimens collected fifty years ago being still viscid to the touch.

Coupled with the wide geographic range of the species is found, as is to be expected, great individual variation among the plants. The whole range of variation, perhaps is to be found among our Mexican specimens. Plants from other parts of the world are comparatively uniform, having commonly glabrous, somewhat fleshy, acute leaves. The Mexican specimens, however, exhibit peculiarities in the form and pubescence of the leaves as well as in the abundance and size of the fruit. So imperceptibly do the forms shade into each other that there seems to be no reliable means of separating them. Most of the strongly pubescent specimens that have been examined represent young growths and would probably become glabrous with age.

Various common names are applied to this species. In Michoacan and Guerrero it is known as *garabato prieto* or *uña del diablo;* in Tamaulipas as *coma de uña;* in Tabasco

as *uña de gato;* in Yucatan as *beeb;* and in Guatemala as *huele de noche.* An infusion of the bark and leaves is said to be used both internally and externally as a cure for inflammation of the joints and for venereal diseases.

7. **Pisonia grandifolia** Standley, sp. nov.

Branches dark reddish brown, stout, smooth and glabrous, armed with few short, slender, strongly curved spines; leaf blades 11 to 15 cm. long and 2.5 to 5 cm. broad, oblanceolate or elliptic, very thick, glabrous, obtuse, attenuate to the base; petioles stout, glabrous, 20 to 25 mm. long; staminate flowers in very loose, much branched corymbs 3 or 4 cm. in diameter; pedicels and peduncles sparingly appressed-puberulent; pistillate flowers and fruit not seen.

Type in the herbarium of Capt. John Donnell Smith, collected at Cubilquitz, Depart. Alta Verapaz, Guatemala, alt. 350 meters, February, 1901, by H. von Tuerckheim (no. 7954). While related to *P. aculeata* this is distinguished by the very large leaves which are different in outline, more obtuse, and tapering at the base.

## 5. SALPIANTHUS Humb. & Bonpl.

*Salpianthus* Humb. & Bonpl. Pl. Aequin. **1:** 155 *pl. 44.* 1808.
*Boldoa* Lag. Gen. & Sp. Nov. 9. 1816.
*Cryptocarpus* H. B. K. Nov. Gen. & Sp. **2:** 187. *pl. 123.* 1817.
Type species, *Salpianthus arenarius* Humb. & Bonpl.

The type species of Boldoa, apparently, is *B. purpurascens.*

The type of Cryptocarpus is *Cryptocarpus globosus,* which is a synonym of *Salpianthus purpurascens.* Another species of Cryptocarpus was described at the same time, *C. pyriformis,* but *C. globosus* was the first mentioned. Doctor Heimerl, while considering *Cryptocarpus globosus* a synonym of *Boldoa ovatifolia* and a member of the genus Boldoa, maintains the genus Cryptocarpus for the South American *Cryptocarpus pyriformis.* That species, evidently, should be made the type of a new genus.

Choisy[a] gives as the place of publication of the genus Boldoa "Catal. H. Madr. 1803" and ascribes the genus to Cavanilles. The writer has attempted to locate this publication, but can find no trace of it. Doctor Barnhart suggests that the catalogue may have been seen by Choisy in manuscript form, but never has been published. If such a publication was ever issued the name Boldoa must, of course, take precedence over Salpianthus.

This genus, as treated here, may be divided into two sections, that containing *S. purpurascens* and that containing the three other species. There is some ground for treating these groups as separate genera, but they do not seem to be of sufficient importance to warrant such treatment here.

### KEY TO THE SPECIES.

Perianth campanulate, little longer than the fruit, green, 3 mm. long or less; leaf blades broadly ovate ..... 1. *S. purpurascens.*
Perianth tubular, much exceeding the fruit, more or less colored, about 5 mm. long; leaf blades lance-ovate.
  Stems strongly flexuose, the branching being almost equally dichotomous; inflorescence dense and compact, 30 cm. broad; flowers in slender racemes 5 cm. long or less, numerous; leaves usually sessile ..... 2. *S. aequalis.*
  Stems straight, not strongly flexuose, the branches alternate but not dichotomous; inflorescence much narrower; flowers in very short, few-flowered racemes; leaves petioled.

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[a] DC. Prodr. **13²:** 438. 1849.

Perianth densely villous, especially in the throat, the hairs, however, rather short; teeth of the perianth very broadly triangular; stems more or less villous above ..... 3. *S. arenarius.*

Perianth only puberulent and slightly viscid; teeth much longer, triangular; stems only puberulent above. (Leaves greener.) ..... 4. *S. macrodontus.*

**1. Salpianthus purpurascens** (Cav.) Hook. & Arn. Bot. Beech. Voy. 508. 1841.

*Boldoa purpurascens* Cav.; Lag. Gen. & Sp. Nov. 10. 1816.

*Boldoa ovatifolia* Lag. loc. cit.

*Cryptocarpus globosus* H. B. K. Nov. Gen. & Sp. **2:** 187. *pl. 123.* 1817.

*Boerhaavia rhomboidea* Humb.; Spreng. Jahrb. Gewächsk. **1**[3]**:** 66. 1818.

*Boldoa paniculata* Mart. & Gal. Bull. Acad. Sci. Brux. **10**[1]**:** 356. 1842.

*Cryptocarpus rhomboideus* Moq. in DC. Prodr. **13**[2]**:** 88. 1849.

Type locality, "Cuba." Type collected by Boldo.

*Specimens examined:*

OAXACA: Valley of Oaxaca, alt. 1,530 to 1,630 meters, September 20, 1894, *Nelson* 1268; near Huajuapan, alt. 1,720 to 2,000 meters, November 16, 1894, *Nelson* 1971; Oaxaca Valley, alt. 1,530 meters, October 1, 1894, *C. L. Smith* 771; Valley of Oaxaca, November 1, 1894, *L. C. Smith* 276.

VERA CRUZ: Barranca de Santa Maria, vicinity of Zacuapan, November, 1906, *Purpus* 2271; Orizaba, 1853, *Müller* 4158.

JALISCO: Waste places near Tequila, October 5, 1893, *Pringle* 4594.

SINALOA: Culiacan, September 22, 1904, *Brandegee;* Ymala, 1891, *Palmer* 1733.

PUEBLA: Tehuacán, December, 1841, *Liebmann.*

MICHOACAN or Guerrero: Petatlan, November 15, 1898, *Langlassé* 640.

COLIMA: Manzanillo, December, 1890, *Palmer* 950.

GUATEMALA: El Rancho, Depart. Jalapa, January 20, 1908, *Kellerman* 8011.

Additional specimens cited by Hemsley: Tepic, *Barclay;* Cordillera of Oaxaca, alt. 1,530 meters, *Galeotti* 582; plains of Tehuacán, alt. 1,530 meters, *Galeotti* 378.

There is a possibility that Lagasca's two names represent different species, but there is nothing to indicate this. The species has the distinction of having appeared three times in De Candolle's Prodromus, twice in the Allioniaceae in the genus Boldoa, and once on page 88 of the same volume as a member of the Chenopodiaceae.

**2. Salpianthus aequalis** Standley, sp. nov.

Plants 75 to 100 cm. high, forming clumps, woody below; stems stout, reddish, striate, strongly flexuose, almost equally dichotomous, sparingly purberulent below, densely subvillous above, the white hairs of the pubescence giving the stems a grayish appearance; leaf blades 65 mm. long or less, elliptic-lanceolate, narrowed at both ends, blunt at the apex, cuneate at the base, usually sessile, puberulent on both surfaces, much paler beneath than above; flowers in dichotomously branching racemes 5 cm. long or less, these collected in a dense cyme 30 cm. broad; flowers on slender pedicels 5 mm. long or less; perianth 5 mm. long, slightly expanded above, abundantly villous, the teeth triangular and much broader than long; fruit compressed-spherical, black and shining.

Type in the National Herbarium, no. 385686, collected on the Monte de Charnaco, Michoacan or Guerrero, at an altitude of 810 meters, March 5, 1898, by E. Langlassé (no. 18). There is another sheet of the same collection in the Gray Herbarium. The collector states that the flowers are white, while he calls those of *S. arenarius* rose. In the dried specimens there does not seem to be any marked difference in color. He also states that the common name of the plant is *catharina.*

The peculiar method of branching immediately distinguishes this from the other closely related species of the genus. In none of the specimens of the other species do

we find any approach to the dichotomous method of branching. Other distinguishing characteristics are the dense and ample inflorescence, paler lower surface of the leaf blades, long racemes of flowers, and sessile leaves.

**3. Salpianthus arenarius** Humb. & Bonpl. Pl. Aequin. **1:** 138. *pl. 44.* 1808.
*Boldoa lanceolata* Lag. Gen. & Sp. Nov. 10. 1816.
Type locality, "In arenosis maritimis mare Pacifici ad Acapulcum."

*Specimens examined:*
JALISCO: Fields, Tuxpan, February, 1904, *Purpus* 509.
COLIMA: Colima, 1891, *Palmer* 1204; Acapulco, 1894–5, *Palmer* 195; Acapulco, *Beechey*.
MICHOACAN or GUERRERO: San Geronimito, April 1, 1899, *Langlassé* 728; Las Salinas, alt. 5 meters, May 9, 1898, *Langlassé* 153.
OAXACA: Cañada, oberh. Totolapam, January 3, 1896, *Caec. & Ed. Seler* 1703; Tehuantepec, 1910, *Orcutt* 3291.
OF INDEFINITE LOCALITY: Pinotepa á lac de Tututepeque, *Galeotti* 586.

Langlassé, in connection with one of the specimens cited above, states that the common name of the plant is *susucua* and that it is used as a remedy for the sting of scorpions.

**4. Salpianthus macrodontus** Standley, sp. nov.

Stems 1 to 2 meters high, single or clustered, bright green, striate, much branched, usually herbaceous throughout, but often persisting for more than a year, finely puberulent throughout, rather more densely so above; leaf blades ovate or lance-ovate, 5 cm. long or usually less, acute, attenuate at the base to the slender petiole, bright green, puberulent on both surfaces; petioles half as long as the blades or less; inflorescence cymose or rarely racemose at the ends of the branches, loose and open, leafy; perianth 7 or 8 mm. long, slightly expanded above, purplish, becoming brown in age, puberulent; pedicels 2 mm. long or less; teeth of the perianth triangular, longer than broad, acute, whitish, thin and scarious, slightly puberulent like the rest of the perianth; stamens exserted about 5 or 6 mm.; fruit compressed-spherical, glabrous, black and shining.

Type in the U. S. National Herbarium, no. 636584, collected on cliffs along the sea near the signal station at Mazatlan, March 31, 1910, by Rose, Standley & Russell (no. 13752).

From the nearly related *S. arenarius* this species differs in having the teeth of the perianth twice as long, more acute, and not villous, the stems and leaves less pubescent, the leaves greener and more acute, and the petioles longer and more slender. The two species seem to have quite distinct ranges, the proposed species occurring to the north near the coasts of Sinaloa and Sonora, while *S. arenarius* occurs farther south.

*Other specimens examined:*
SINALOA: Vicinity of Culiacan, September 22, 1904, *Brandegee;* Ymala, 1891, *Palmer* 1722; moist field near Villa Union, April 2, 1910, *Rose, Standley & Russell* 13959; sandy soil along river at Fuerte, March 27, 1910, *Rose, Standley & Russell* 13672; along an arroyo near San Blas, March 22, 1910, *Rose, Standley & Russell* 13212; dry hills, Culiacan, April 21, 1910, *Rose, Standley & Russell* 14945.
SONORA: Alamos, September, 1890, *Palmer* 310 and 720; vicinity of Alamos, March 16, 1910, *Rose, Standley & Russell* 12905; about 5 miles below Minas Nuevas, March 12, 1910, *Rose, Standley & Russell* 12689.

At San Blas, Sinaloa, the common name of the plant was given as *guayavilla;* this is said to be applied because the odor of the plant is similar to that of the cultivated "guayava." At Alamos the stems were seen used for the walls of the huts of some of the natives.

The plant seems to be common from Alamos, Sonora, south to Villa Union, Sinaloa, but was not observed farther south. It grows under various conditions, sometimes on dry hills, again in river valleys, sometimes along arroyos, or even in wet fields.

## 6. COLIGNONIA Endl.

*Colignonia* Endl. Gen. Pl. 311. 1837.
Type species, *Abronia parviflora* H. B. K.

A genus of four or five species, all South American. It has not been reported from North America before.

**1. Colignonia parviflora** (H. B. K.) Endl. Gen. Pl. 311. 1837.
*Abronia parviflora* H. B. K. Nov. Gen. & Sp. **2:** 216. 1817.
*Tricratus parviflorus* Spreng. Syst. Veg. **1:** 536.
Type locality, "Locis scopulosis in dorso Andium Popayensium prope Querchu."

*Specimen examined:*

PANAMA: *Hayes.*

## 7. BOUGAINVILLEA Commers.

*Bougainvillea* Commers.; Juss. Gen. 91. 1789.
*Josepha* Vell. Fl. Flum. 154. 1825.
Type species, *Bougainvillea spectabilis* Willd.

### KEY TO THE SPECIES.

Stems and petioles, often the leaf blades, glandular-pubescent.....1. *B. spectabilis.*
Stems and petioles, as well as the leaf blades, glabrous or nearly so..2. *B. glabra.*

**1. Bougainvillea spectabilis** Willd. Sp. Pl. **2:** 348. 1798.
*Tricycla spectabilis* Poir. Encycl. Suppl. **5:** 358. 1817.
*Bougainvillea bracteata* Pers. Syn. Pl. **1:** 418. 1805.
*Bougainvillea brasiliensis* Wied-Neuw. Reis. Bras. **1:** 44. 1820.
*Josepha augusta* Vell. Fl. Flum. 154. 1825.
*Bougainvillea virescens* Choisy in DC. Prodr. **13²:** 437. 1849.
Type locality, "In Brasilia."

*Specimens examined:*

MEXICO: City of Mexico, winter of 1892–3, *Mrs. D. H. Sheldon.*
SONORA: Cultivated at Hermosillo, March 9, 1910, *Rose, Standley & Russell* 12548.
HONDURAS: Ruatan Island, Bay of Honduras, 1886, *Gaumer* 134.
SALVADOR: *Renson* 113.
GUATEMALA: Sombrerito, Depart. Santa Rosa, alt. 1,250 meters, March, 1894. *Heyde & Lux* 6370.

One of the handsomest of cultivated plants, this is perhaps the most common ornamental in Mexico. It decorates the *patios* of the poorest houses as well as those of the most elaborate ones. It is not native in any part of Mexico but may possibly be so in parts of Central America.

**2. Bougainvillea glabra** Choisy in DC. Prodr. **13²:** 437. 1849.
*Bougainvillea spectabilis glabra* Hook. Curtis's Bot. Mag. *pl. 4810.* 1854.
*Bougainvillea rubicunda* Schott; Rohrb. in Mart. Fl. Bras. **14²:** 351. 1872.
Type locality, "In locis elevatis prov. Rio de Janeiro," Brazil. Type collected by Gaudichaud (no. 423).

*Specimens examined:*

YUCATAN: 1896, *Valdez* 9.
SALVADOR: Santa Ana, Depart. Santa Ana, alt. 650 meters, November, 1892, *Shannon* 5002.
GUATEMALA: Sepacuité, December 12, 1904, *Goll* 152.

The glabrous Bougainvillea perhaps hardly deserves specific rank. It is impossible to draw any sharp line between the two forms. Like *B. spectabilis* it is not a native of any part of North America, unless it is the southernmost region, but it is widely cultivated and sometimes seems to have escaped.

## 8. TRIPTEROCALYX Hook.

*Tripterocalyx* Hook. Journ. Bot. Kew Misc. **5**: 261. 1853.
*Cycloptera* Nutt.; A. Gray, Amer. Journ. Sci. II. **15**: 319. 1853, not Endl. 1841.
*Apaloptera* Nutt.; A. Gray, loc. cit.
Type species, *Abronia micrantha* Torr.

**1. Tripterocalyx cyclopterus** (A. Gray) Standley, Contr. Nat. Herb. **12**: 329. 1909.
*Abronia cycloptera* A. Gray, Amer. Journ. Sci. II. **15**: 319. 1853, excluding synonyms.
*Abronia carnea* Greene, Pittonia **3**: 343. 1898.
Type locality, "On the Rio Grande, New Mexico." Type collected by Charles Wright (no. 1712).

*Specimens examined:*

CHIHUAHUA: Sandhills near Paso del Norte (Ciudad Juárez), 1885, *Pringle* 75; Sabinal, Sierra Madre, alt. 1,290 meters, September 29, 1903, *Jones*.

## 9. ABRONIA Juss.

*Abronia* Juss. Gen. 448. 1789.
*Tricratus* L'Her.; Willd. Sp. Pl. **1**: 807. 1799.
Type species, *Abronia umbellata* Lam.

The Abronias are known in Mexico under the names of *alfombrilla de los arenales* and *alfombrilla de la playa*. The roots of *A. maritima* are said to be eaten sometimes by the Indians.

### KEY TO THE SPECIES.

Stems erect or strongly ascending; perianth greenish white..... 1. *A. fendleri.*
Stems prostrate or merely ascending; perianth purplish red.
  Flowers of a deep, dark red; fruit strongly coriaceous..... 2. *A. maritima.*
  Flowers much paler, purplish red; fruit with thin walls and wings.
Anthocarp not winged but 5-lobed..... 3. *A. torreyi.*
Anthocarp 5-winged.
  Wings of the fruit much narrowed below, the body strongly ribbed or pitted; leaf blades not sinuate-margined..... 4. *A. villosa.*
  Wings of the fruit slightly if at all narrowed below, the body smaller and not ribbed or pitted; leaf blades more or less sinuate.
    Leaf blades only slightly sinuate; plant stout; fruit 10 to 12 mm. long, its wings thin.... 5. *A. platyphylla.*
    Leaf blades strongly sinuate, narrower; fruit 7 mm. long or less, its wings comparatively thick.. 6. *A. gracilis.*

**1. Abronia fendleri** Standley, Contr. Nat. Herb. **12**: 324. *pl. 43*. 1909.
Type locality, "Santa Fe, New Mexico." Type collected in 1847, *Fendler* 739.

*Specimens examined:*

CHIHUAHUA: On sandhills near Paso del Norte (Ciudad Juárez), September 20, 1886, *Pringle* 794.

As stated when the species was published, the plants from the southern part of the Rio Grande Valley are not typical *fendleri* and may be specifically distinct. The

southern form is marked by its more erect, less branched habit, yellowish green leaves, more strongly pubescent stem, and narrower and firmer fruit. The plants are common upon the sandy mesas bordering the Rio Grande Valley in this region, but do not occur in the valley itself. They spring up in late summer after the rains, seldom or never becoming diffuse and spreading like the more northern plant.

**2. Abronia maritima** Nutt.; S. Wats. in Brewer & Wats. Bot. Cal. **2:** 4. 1880.

Type locality, "On the sea coast from Santa Barbara to San Diego," California.

*Specimens examined:*

BAJA CALIFORNIA: All Saints Bay, May 15, 1885, *Greene;* San Martin Island, 1889, *Pond;* San Quentin Bay, February, 1889, *Palmer* 721; Socorro, May 7, 1886, *Orcutt;* without locality, *Diquet;* Cape San Quentin, May 10, 1885, *Greene;* La Playa de Santo Tomás, July 17, 1885, *Orcutt;* San Bartólome Bay, 1911, *Rose* 223; San Josef, 1911, *Rose* 559.

SONORA: Near Guaymas, February 22, 1904, *Palmer* 1210.

SINALOA: Altata, April 18, 1910, *Rose, Standley & Russell* 14836; Altata, June 15, 1897, *Rose* 1347.

TEPIC: Maria Magdalena Island, May 28, 1897, *Maltby* 174.

The type of this species is not to be found in the herbarium of the Philadelphia Academy of Science, at least no specimen of the plant accessible to Nuttall is there. There is however, a specimen of *Hesperonia californica* from "St. Barbara, prope maris, N. Calif.," given, in Nuttall's handwriting, the specific name of *maritima* and referred to the genus Calymenia. Is it possible that Doctor Watson misunderstood Nuttall's application of the name *maritima* and referred it wrongly to the genus Abronia?

**3. Abronia torreyi** Standley, Contr. Nat. Herb. **12:** 319. *pl. 38.* 1909.

Type locality, "Mesilla, Donna Ana County, New Mexico." Type collected by E. O. Wooton in 1897 (no. 11).

*Specimens examined:*

CHIHUAHUA: Sandy soil, Rio Grande Valley, Juárez, alt. 2,310 meters, May 5, 1901, *Pringle* 9465; sandhills near Paso del Norte (Ciudad Juárez), May 5, 1885, *Pringle* 77; sandhills below El Paso (Ciudad Juárez), 1846, *Wislizenus* 93; Ciudad Juárez, 1905, *Purpus.*

**4. Abronia villosa** S. Wats. Amer. Nat. **7:** 302. 1873.

Type locality, "Arizona."

*Specimens examined:*

SONORA: Mesa near La Grulla, January 3, 1904, *MacDougal.*

**5. Abronia platyphylla** Standley, Contr. Nat. Herb. **12:** 314. *pl. 33.* 1909.

Type locality, "Del Mar, California." Type collected by T. S. Brandegee, May 12, 1894.

*Specimens examined:*

BAJA CALIFORNIA: Los Angeles Bay, 1887, *Palmer* 604; San Quentin Bay, February, 1889, *Palmer* 735.

**6. Abronia gracilis** Benth. Bot. Voy. Sulph. 44. 1844.

Type locality, "Bay of Magdalena," Baja California.

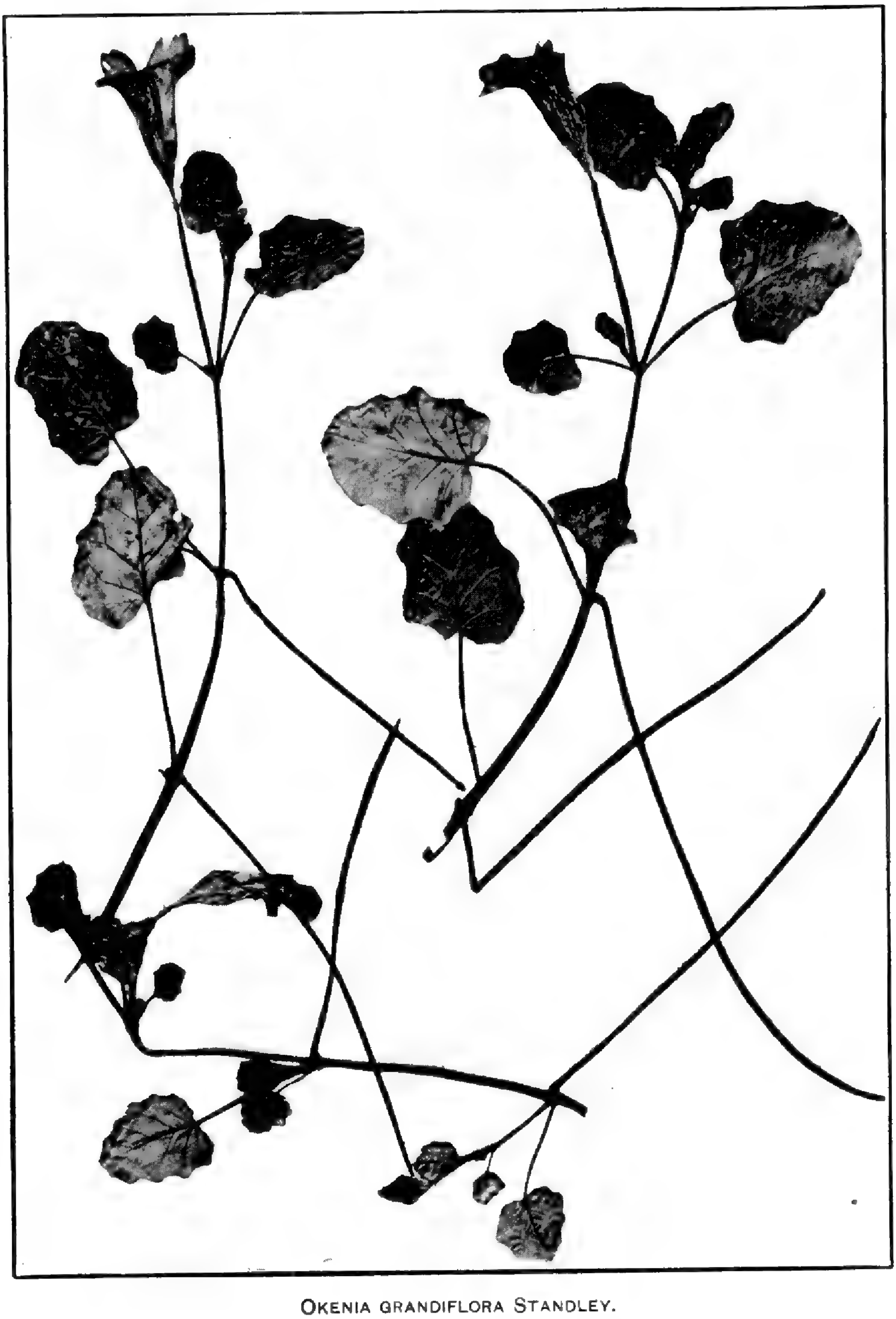
*Specimens examined:*

BAJA CALIFORNIA: Sandy plains, Calmalli, 1898, *Purpus* 81; San Bartólome Bay, 1889, *Pond;* Magdalena Island, 1889, *Brandegee;* Abrejos Point, 1876, *Streets;* San Ramon, 1886, *Orcutt;* Magdalena Bay, *Bryant;* Magdalena Island, 1911, *Rose* 315; San Bartólome Bay, 1911, *Rose* 198.

## 10. OKENIA Schlecht. & Cham.

*Okenia* Schlecht. & Cham. Linnaea **5:** 92. 1830.

Type species, *Okenia hypogaea* Schlecht. & Cham.



OKENIA GRANDIFLORA STANDLEY.

KEY TO THE SPECIES.

Perianth about 55 mm. long..... 1. *O. grandiflora.*
Perianth 35 mm. long or less.
  Leaves strongly undulate, very unequal at the base; lobes of the perianth deeply cleft..... 2. *O. hypogaea.*
  Leaves entire, equal at the base; lobes of the perianth shallowly retuse..... 3. *O. rosei.*

**1. Okenia grandiflora** Standley, sp. nov. PLATE 76.

Stems stout, viscid-villous, the internodes 5 to 8 cm. long; leaf blades oblong or oblong-ovate, 17 to 52 mm. long, 17 to 45 mm. wide, thin, rounded or obtuse at the apex, unequal and truncate or subcordate at the base, with strongly undulate margins, glabrous or sparingly pilose above, villous beneath along the veins, the opposite leaves strongly unequal; petioles stout, 20 to 60 mm. long, densely villous and viscid; involucre of 3 triangular-ovate bracts 3 mm. long, very viscid and villous; perianth 55 mm. long, the limb 40 mm. wide, the tube very narrow at the base but soon widening above, the limb rather deeply lobed, sparingly villous without; stamens about 15, unequal, strongly curved upward; peduncles 55 to 60 mm. long at anthesis, soon lengthening to 20 cm. or more, stout, strongly villous; fruit not seen.

Type in the Gray Herbarium, collected by Mr. C. G. Pringle in the barranca of Tequila, in the State of Jalisco, July 4, 1893 (no. 5444). Apparently the plant was not obtained in quantity, for this collection has not been seen in any other herbarium. In addition to being strikingly different in the size of its flowers and less obtrusively in some minor particulars, such as the number of stamens, this plant occurs in a very different habitat from that of *O. hypogaea*, the latter being invariably maritime.

The photograph is of the type specimen.

**2. Okenia hypogaea** Schlecht. & Cham. Linnaea **5:** 92. 1830. PLATE 75, A.

Type locality, "In collibus arenosis prope Vera Cruz." Type collected by Schiede and Deppe (no. 107).

*Specimens examined:*

OAXACA: Chiltepec, 1890, *Rovirosa* 726.

VERA CRUZ: Type collection in the Bernhardi Herbarium of the Missouri Botanical Garden; 1910, *Orcutt* 3293.

COLIMA: Acapulco, 1895, *Palmer* 490; Colima, 1897, *Palmer* 39 and 40.

SINALOA: Altata, September 2, 1904, *Brandegee;* sand dunes along the beach north of Mazatlan, April 4, 1910, *Rose, Standley & Russell* 14006.

Although first collected so long ago, no member of the Allioniaceae has been so little collected or is so poorly represented in collections. In some of the larger herbaria no material at all is to be found. In general appearance specimens simulate Wedeliella, and possibly they have been neglected by collectors who confused them with these common plants.

The writer has examined a specimen of the type collection in the herbarium of the Missouri Botanical Garden. It accords well with specimens collected along the coast in various parts of Mexico. Unfortunately, no fruit is present. Because of the peculiar fruiting habit of the genus, exactly like that of the peanut, the fruit is usually left underground when the plants are pulled up. The authors of the genus seem to have had fruit, for they describe it as having ten longitudinal ribs. If this statement is true, the plant of the Pacific beaches is different from that found on the eastern coast, for its fruit is smooth. Doctor Heimerl states that he has seen no fruit of the genus in any European herbarium.

In April, 1910, the writer found one or two growing plants on the dunes of pure sand that line the coast north of Mazatlan, Sinaloa. These were merely individuals that had persisted from the previous season, the plant being an annual. The dead

branches were found everywhere in the greatest abundance, often reaching a length of two meters and subdividing profusely. By digging down in the sand to a depth of 6 inches or more large numbers of the fruits were found. These are about 12 mm. long, brown, and smooth. The seed is oblong, about 7 mm. long, surrounded by a thick, spongy pericarp. The fruits and seeds shown in the plate (facing p. 388) were photographed from specimens obtained at Mazatlan.

Seeds were brought to Washington and planted with successful results. The plants bloomed in about four weeks from the time of sowing. The young plants show a cruciform method of branching; their stems and leaves are very viscid. The peduncles at first are short but elongate rapidly, turn downward, and penetrate the sand to a depth of several inches. The flowers are rather handsome, their size sufficient to make them conspicuous, but the plants are not adapted to use as ornamentals because they soon lose their leaves and become mats of coarse, awkward stems.

Besides the specimens cited from Mexico I have seen a collection from the coast of southern Florida, a notable extension of range. The species should be found on some of the islands of the West Indies, but so far it has not been reported.

**3. Okenia rosei** Standley, sp. nov.

Annual with prostrate, spreading stems; these slender, densely viscid and villous; leaf blades ovate to oblong, entire, truncate or rounded and equal at the base, rounded at the apex, of about the same color on both surfaces, pubescent to puberulent above and below; opposite leaves very unequal, the larger 20 to 32 mm. long and 13 to 22 mm. wide, the smaller ones about 10 mm. long and 8 mm. wide; petioles of larger blades 8 to 15 mm. long; peduncles at anthesis about 15 mm. long, but soon lengthening to 10 to 15 cm.; bracts lanceolate, 3 mm. long, with subulate tips, villous; perianth about 25 mm. long, very slender at the base for about 9 mm., then becoming much thicker and soon expanding into a limb 18 mm. in diameter, this 5-lobed, the lobes broadly oblong, shallowly retuse; perianth villous without; stamens about 9, unequal.

Type in the U. S. National Herbarium, no. 301784, collected by J. N. Rose at Bolaños, in the State of Jalisco, September 10 to 19, 1897 (no. 2845). The plant is closely related to *O. hypogaea*, but that is maritime, while this grows far inland. The leaves are entire instead of strongly undulate and are not extremely unequal at the base as in that species; the lobes of the perianth are only shallowly retuse instead of deeply cleft.

## 11. SELINOCARPUS A. Gray.

*Selinocarpus* A. Gray, Amer. Journ. Sci. II. **15**: 262. 1853.
Type species, *Selinocarpus diffusus* A. Gray.

### KEY TO THE SPECIES.

Leaves broadly ovate. (Perianth less than 10 mm. long)..... 1. *S. chenopodioides.*
Leaves linear or nearly so.
  Perianth 10 mm. long or less, with scarcely any tube..... 2. *S. angustifolius.*
  Perianth about 15 mm. long, with a conspicuous tube..... 3. *S. palmeri.*

**1. Selinocarpus chenopodioides** A. Gray, Amer. Journ. Sci. II. **15**: 262. 1853.

Type locality, "Valleys from Providence Creek to the Rio Grande," Texas. Type collected by Charles Wright (no. 1707).

*Specimens examined:*

CHIHUAHUA: Dry calcareous bluffs, Ciudad Juárez, alt. 1,130 meters, September 26, 1902, *Pringle* 11143; plains near Chihuahua, August 18, 1885, *Pringle* 652; Santa Eulalia plains, August 18, 1885, *Wilkinson.*

**2. Selinocarpus angustifolius** Torr. Bot. Mex. Bound. 170. 1858.

Type locality, "Gravelly table land near Presidio del Norte," Texas.

*Specimens examined:*

COAHUILA: San Lorenzo de Laguna, 1880, *Palmer* 1119; Viesca, 1905, *Purpus* 1054; Mesillas near Saltillo, 1848, *Gregg* 535.

**3. Selinocarpus palmeri** Hemsl. Biol. Centr. Amer. Bot. **3:** 6. 1882.

Type locality, "North Mexico, San Lorenzo de Laguna, Coahuila." Type collected by Dr. Edward Palmer in 1880 (no. 1118).

Only the type collection has been seen.

## 12. WEDELIELLA Cockerell.

*Wedeliella* Cockerell, Torreya **9:** 167. 1909.
*Allionia* L. Syst. ed. 10. 890. 1759, in part.
*Wedelia* Loefl.; Kuntze, Rev. Gen. Pl. 533. 1891, not Wedelia Jacq. 1760.
Type species, *Allionia incarnata* L.

### KEY TO THE SPECIES.

Involucre not viscid; perianth usually white (scarcely exceeding the involucre); teeth of the anthocarp very slender, 5 or 6 in each row; annual..... 1. *W. glabra.*

Involucre densely viscid; perianth purplish red; teeth of the anthocarp stouter and broader, usually fewer; perennials.

Perianth 11 to 13 mm. long (more than twice as long as the involucre); plant stout and densely viscid throughout; leaf blades densely pubescent on both surfaces..... 2a. *W. incarnata villosa.*

Perianth less than 10 mm. long; plants more slender and less densely viscid; leaf blades often glabrous..... 2. *W. incarnata.*

**1. Wedeliella glabra** (Choisy) Cockerell, Torreya **9:** 167. 1909.
*Allionia incarnata glabra* Choisy in DC. Prodr. **13**$^2$**:** 435. 1849.
*Wedelia glabra* Standley, Contr. Nat. Herb. **12:** 332. 1909.
Type locality, "Circa Mexicum." Type collected by Berlandier (no. 577).

*Specimens examined:*

MEXICO: Type collection; Chapultepec, September 21, 1869, *Bilimek* 167; Valley of Mexico, Guadalupe, June, 1865–6, *Bourgeau* 293; Guadalupe, July 18, 1867, *Bilimek* 167a.
AGUASCALIENTES: Near Aguascalientes, October 9, 1903, *Rose & Painter* 7733.
ZACATECAS: Near San Juan Capistrano, August 19, 1897, *Rose* 2438 and 3539.
SAN LUIS POTOSÍ: San Luis Potosí, 1879, *Schaffner* 175, 562; Media Luna near Rio Verde, June, 1904, *Palmer* 73.
OAXACA: De Matatlan á Tlacolula, alt. 1,600 meters, June, 1906, *Conzatti* 1468.
PUEBLA: Tlacuiloltepec, alt. 1,800 to 2,100 meters, August, 1909, *Purpus* 4008; Santa Lucia near San Luis Tultitlanapa, June, 1908, *Purpus* 3372; ? near Tehuacán, 1905, *Rose, Painter & Rose* 10165; Tehuacán, August 9, 1910, *Hitchcock.*
TAMAULIPAS: Vicinity of Victoria, 1907, *Palmer* 378.
COAHUILA: Near Saltillo, 1848, *Gregg* 466, 484; Saltillo, July 10 to 14, 1910, *Hitchcock.*

Possibly more than a single species is represented by the specimens listed, but the forms are very difficult of separation.

**2. Wedeliella incarnata** (L.) Cockerell, Torreya **9:** 167. 1909.
*Allionia incarnata* L. Syst. ed. 10. 890. 1759.
*Allionia malacoides* Benth. Bot. Voy. Sulphur 44. 1844.
*Wedelia incarnata* Kuntze, Rev. Gen. Pl. 533. 1891.
Type locality, "Juxta Cumana urbem, in silvis arenosis," Venezuela.

*Specimens examined:*

DURANGO: Durango and vicinity, 1896, *Palmer* 595; barren hills about Tlahualilo, alt. 1,000 meters, August 27, 1905, *Pittier* 486.

CHIHUAHUA: Vicinity of Chihuahua, alt. 1,300 meters, May, 1908, *Palmer* 194; Santa Eulalia Plains, July 24, 1885, *Wilkinson;* near Chihuahua, 1886, *Pringle* 1062.

COAHUILA: Saltillo and vicinity, April, 1898, *Palmer* 811; near Saltillo, November, 1902, *Palmer* 288.

TAMAULIPAS: Nuevo Laredo, September 28, 1897, *Rose* 3078.

SONORA: MacDougal Crater, Pinacate Mountains, November 14, 1907, *MacDougal* 30; rocky hill near Hermosillo, March 4, 1910, *Rose, Standley & Russell* 12353.

BAJA CALIFORNIA: Signal Mountain, May 6, 1894, *Schoenfeldt* 2952; Los Angeles Bay, 1887, *Palmer* 100; Cucopa Mountains, April 5, 1905, *MacDougal* 144; Agua Verde, 1911, *Rose* 916.

NUEVO LEÓN: Monterey, June 6 to 8, 1910, *Hitchcock.*

*Allionia malacoides* was described from specimens collected at Magdalena Bay in Baja California and it is not improbable that it is either specifically or subspecifically, distinct. The disposition of the specimens listed here is far from satisfactory to the author. It is certain that more than one form is represented, but with the material at hand it seems impossible to distinguish them definitely. Some of the plants have small, thick leaves, while others have larger, thinner ones. The fruit is variable in color and in form, especially in the number, shape, and size of the teeth. The size of the perianth varies considerably.

In Coahuila and San Luis Potosí the plant is known under the names of *yerba de la hormiga, yerba de buendia,* and *yerba del golpe.* The dried plants are sold in the markets of some of the cities to be used in the form of a hot decoction for the cure of diarrhœa.

**2a. Wedeliella incarnata villosa** (Standley) Cockerell, Torreya **9:** 167. 1909.

*Wedelia incarnata villosa* Standley, Contr. Nat. Herb. **12:** 333. 1909.

Type locality, "Mesas and foothills in Arizona." Type collected in 1881 by C. G. Pringle.

*Specimens examined:*

CHIHUAHUA: Mexican Boundary line near Whitewater, June 18, 1892, *Mearns* 361; same locality, June 20, 1892, *Mearns* 368.

## 13. NYCTAGINIA Choisy.

*Nyctaginia* Choisy in DC. Prodr. **13**[2]**:** 429. 1849.

Type species, *Nyctaginia capitata* Choisy.

A genus of two species, only one of which is known from Mexico.

**1. Nyctaginia capitata** Choisy in DC. Prodr. **13**[2]**:** 429. 1849.

*Boerhaavia aggregata* Pavon; Choisy, loc. cit., as synonym.

*Boerhaavia capitata* Heimerl, Jahresb. Oberrealsch. Fünfhaus **23:** repr. 28. 1897.

Type locality, "In Texas apud S.-Antonio de Biscar." Type collected by Berlandier.

*Specimens examined:*

CHIHUAHUA: Gallejo Springs between El Paso and Chihuahua, 1846, *Wislizenus* 111.

COAHUILA: Saltillo, 1848, *Gregg;* vicinity of Saltillo, June, 1898, *Palmer* 202; near Saltillo, November, 1902, *Palmer* 280; Sabinas, May 21, 1902, *Nelson* 6761.

NUEVO LEÓN: Monterey, *Edwards.*

DURANGO: Mapimi, October, 1898, *Palmer* 545; Santiago Papasquiaro, 1896, *Palmer* 447; Papasquiaro, August 7, 1898, *Nelson* 4668; El Oro, August 15, 1898, *Nelson.*

INDEFINITE LOCALITY: Cienega Grande east of Camargo, May 18, *Gregg* 264.

In very young specimens the flowers are cleistogamous and the heads on short peduncles in the axils of the lowest leaves, giving the plants a very different appearance from that usual later in the season.

The large fleshy roots are sliced and dried and used as a remedy for wind colic. About Saltillo the plant is known as *yerba blanca*.

## 14. ALLIONIA L.

*Allionia* L. Syst. Nat. ed. 10. 890. 1759.
*Vitmania* Turra; Cav. Icon. Pl. **3**: 53. 1794, not *Vitmannia* Vahl. 1794.
*Oxybaphus* L'Her.; Willd. Sp. Pl. **1**: 185. 1797.
*Calyxhymenia* Orteg. Hort. Matr. Dec. 5. 1797.
*Calymenia* Pers. Syn. Pl. **1**: 36. 1805.
*Mirabilis* Heimerl in Engl. & Prantl, Pflanzenfam. **3**$^{1b}$: 24. 1894, in part, not L.
Type species, *Allionia violacea* L.

The genus as published by Linnaeus consisted of two species, *violacea* and *incarnata*, the former cited first. The latter is the type of the genus Wedeliella. The genus Allionia was published without a specific combination by Loefling in 1758. The plant described by that author was the one to which Linnaeus gave the name of *Allionia violacea*. Since Loefling's description may not be readily accessible to all who may wish to consult it, it is reproduced here, as follows:

Allionia Loefl. Iter Hisp. 181. 1758.

*Radix* . . . .
*Caulis* herbaceus, erectus, debilis, ramosus.
*Folia* opposita, cordata, acuta, integerrima, glabra, inferiora longe petiolata.
*Flores* in panicula ramosa, terminales, bracteolis brevibus.
Corolla majuscula purpureo-caerulea. (Hinc facie recedit a superiori planta,[a] ut & corollae magnitudine.)
CAL. *Involucrum* commune monophyllum, laxum, quinquefidum: laciniis ovato-acutis, paulo inaequalibus, divisura una usque ad basin sectum, persistens.
*Perianthium* proprium nullum.
COR. aggregata triflora, aequalis, *propria* infundibuliformis s. obconica: ore erecto, quinquefido: laciniis exterioribus paulo longioribus.
STAM. *Filamenta* quatuor, setacea, corolla longiora ad unum latus flexa. *Antherae* subrotunda.
PIST. sing. *Germen* sub corollula, oblongum, obsolete octangulum, *Stylus* setaceus staminibus longior, *Stigma* multifidum, lineare.
PER. nullum.
SEM. solitaria, oblonga, quinquangula, tuberculis undique inaequalia, nuda.
A praecedente[a] imprimis differt calyce & partim corolla.
*Cumanensibus* Jasminullo.

It has been doubted by some whether this description really refers to a plant of the Allioniaceae, on account of the phrase in the description of the involucre, "*divisura una usque ad basin sectum.*" So far as we know this is true of no Allionia. However, it sometimes happens that one of the divisions of the involucre is more deeply cut than the others, and in the pressing of specimens the involucre might be torn so as to produce the effect described. Otherwise the diagnosis exactly fits the so-called *Allionia violacea*, and, so far as we know, no other plant.

Hemsley listed from our region nine species of the genus Oxybaphus: *aggregatus*, *angustifolius*, *cervantesii*, *cordifolius*, *glabrifolius*, *ovatus*, *violaceus*, *wrightii*, and *viscosus*. Four of these are listed here under the same specific names. *Oxybaphus angustifolius* is a synonym of *Allionia linearis; O. cervantesii*, *O. cordifolius*, and *O. ovatus* were probably wrong identifications; *O. wrightii* is *Allioniella oxybaphoides*.

[a] Wedelia Loefl.

In the present paper twenty-four species and subspecies are included, some of them additions of older species due to more extended exploration of the field, but most of them species described since the appearance of the Biologia Centrali-Americana, or new species first published in this paper.

The genus is well represented in Mexico, the number of species being only slightly less than that found in the United States. The species are most abundant in the northeastern part of the Republic, especially in the States of Chihuahua, Sonora, and Coahuila. In the extreme southern part and in Central America but two forms are known to occur, the rather cosmopolitan tropical species, *Allionia violacea* and *A. viscosa*. None of the species have been reported from the west side of the Sierra Madre.

### KEY TO THE SPECIES.

Perianth scarlet, with a conspicuous tube, bilobate. (Leaves linear)..... 1. *A. coccinea.*

Perianth not scarlet, campanulate, not bilobate.

Anthocarp glabrous.

Leaves linear or linear-lanceolate.

Stems and leaves glabrous..... 11. *A. glabra recedens.*

Stems densely pilose-viscid above; leaves ciliate or pilose-viscid..... 12. *A. gausapoides.*

Leaves not linear nor linear-lanceolate.

Plants more than 1 meter high, much branched; stems pubescent throughout.

Involucres 1-flowered; stems and leaves viscid; uppermost leaves conspicuously petioled..... 2. *A. viscosa.*

Involucres 2 or 3-flowered; stems and leaves puberulent but not viscid; uppermost leaves almost sessile..... 3. *A. rotata.*

Plants much lower and less branched; stems glabrous, at least below.

Plants very slender, lax (stems often decumbent); leaves very thin, bright green, not fleshy.

Leaf blades ovate, acute; stems without gland-tipped hairs..... 4. *A. violacea.*

Leaf blades lance-ovate, obtuse; stems with numerous gland-tipped hairs above..... 5. *A. mollis.*

Plants with stout, erect stems; leaves usually thick and fleshy, often glaucous.

Involucres usually 3-flowered.

Leaf blades 40 to 70 mm. long, cordate; inflorescence naked, corymbose..... 6. *A. cardiophylla.*

Leaf blades 35 mm. long or less, truncate at the base; inflorescence leafy, irregularly panicled..... 7. *A. deltoidea.*

Involucres 1-flowered.

Inflorescence paniculate..... 8. *A. texensis.*

Inflorescence corymbose.

Leaf blades narrowly lanceolate, 3 times as long as broad; involucres 4 mm. high or less..... 9. *A. microchlamydea.*

Leaf blades lance-ovate, twice as long as broad or less; involucres about 6 mm. high ..... 10. *A. corymbosa.*

Anthocarp not glabrous.

Leaves linear or narrowly linear-lanceolate.

Leaves distinctly petioled, comparatively thin .. 13. *A. divaricata.*

Leaves sessile, thick and fleshy ..... 14. *A. linearis.*

Leaves lanceolate or wider.

Inflorescence mostly axillary.

Stems hirsute ..... 15. *A. aggregata.*

Stems viscid, not hirsute ..... 16. *A. brandegei.*

Inflorescence terminal.

None of the leaves conspicuously petioled.

Plant stout; leaves linear-lanceolate, 55 mm. long and 17 mm. wide or less; lobes of the involucre elliptic or ovate, obtuse ..... 17. *A. pseudaggregata.*

Plant smaller and more slender; leaves linear-lanceolate, 27 mm. long and 5 mm. wide or less; lobes of the involucre lanceolate or elliptic, acute ..... 18. *A. trichodonta.*

All leaves except the uppermost conspicuously petioled.

Stems more or less pubescent throughout, densely so above.

Stems viscid-puberulent below ..... 19. *A. coahuilensis.*

Stems subhirsute below ..... 20. *A. greggii.*

Stems glabrous at least below.

Stems woody below (hispid above; ribs of the fruit broad and smooth) ..... 21. *A. suffruticosa.*

Stems herbaceous throughout.

Involucres glabrate in age, usually 1-flowered, 6 to 11 mm. high; ribs of the fruit broad and smooth .. 22. *A. foliosa.*

Involucres densely viscid, 3-flowered, about 6 mm. high; ribs of the fruit narrow and tuberculate .. 23. *A. melanotricha.*

1. **Allionia coccinea** (Torr.) Standley, Contr. Nat. Herb. **12:** 339. 1909.

*Oxybaphus coccineus* Torr. Bot. Mex. Bound. 169. 1859.

*Mirabilis coccinea* Benth. & Hook. Gen. Pl. **3:** 3. 1880.

*Allionia linearis coccinea* Jones, Contr. Western Bot. **10:** 51. 1902.

TYPE LOCALITY: "Hill-sides, Copper Mines," New Mexico. Type collected by Charles Wright, no. 1723.

*Specimens examined;*

SONORA: San José Mountains, 1893, *Mearns* 1757; Santa Cruz Mountains, *Capt. E. K. Smith.*

This is so different from other species of the genus as to appear almost anomalous, which accounts for the fact that it has long been considered to belong to another genus, Mirabilis. It can not well be placed there, however, because it has 2 or 3

flowers in each involucre and the fruit is very prominently 5-lobed. The anthocarp differs decidedly from that of other species of Allionia, the ribs being much thicker, the intervening angles more acute, and the ribs of different shape. Because of its peculiarities Dr. Heimerl placed the species in a separate section of Mirabilis which he named Mirabilopsis. Another character, which seems not to have been noticed before, is that the perianth is bilabiate. By some these differences, taken with the characteristic coloring of the perianth, might be considered the basis for generic segregation. The plant, however, in habit and general appearance so closely simulates other species of the genus that it seems much better to leave it in Allionia.

**2. Allionia viscosa** (Cav.) Kuntze, Rev. Gen. Pl. 533. 1891.

*Mirabilis viscosa* Cav. Icon. Pl. **1:** 13. *pl. 19*. 1791.
*Calyxhymenia viscosa* Orteg. Hort. Matr. Dec. **1**: 6. 1797.
*Calymenia viscosa* Pers. Syn. Pl. **1:** 36. 1805.
*Vitmania viscosa* Turra; Steud. Nom. Bot. 140. 1821, as synonym.
*Oxybaphus viscosus* L'Her.; Choisy in DC. Prodr. **13²:** 430. 1849.
Type locality, "In Urbe Huanuco Imperii Peruani."

*Specimens examined:*

CHIHUAHUA: Hacienda de San Miguel, September, 1885, *Palmer* 233.
TAMAULIPAS: Vicinity of Victoria, 1907, *Palmer* 179.
JALISCO: Bolãnos, September, 1897, *Rose* 2902.
GUANAJUATO: Guanajuato, December 9, 1898, *Deam* 173.
ZACATECAS: Zacatecas, October 3 and 4, 1910, *Hitchcock*.
OAXACA: Near Tamazulapam, alt. 2,000 to 2,150 meters, November 16, 1894, *Nelson* 1956; El Parian-Etla, November, 1898, *Gonzalez & Conzatti* 893.
MORELOS: Cuernavaca, January 18, 1866, *Bilimek* 388.
PUEBLA: Tehuacán, December, 1841, *Liebmann;* valley near Tehuacán, alt. 1,690 meters, August 23, 1901, *Pringle* 8600; near Tehuacán, August 1 and 2, 1901, *Rose & Hay* 5929; Tehuacán, August 9, 1910, *Hitchcock*.
HIDALGO: Chalk bluffs near Tula, alt. 2,090 meters, September 20, 1902, *Pringle* 11141.

Hemsley cites the following additional specimens: Real del Monte to Zacatecas, *Coulter* 1427; Puebla, *Andrieux* 126.

**3. Allionia rotata** Standley, Contr. Nat. Herb. **12**: 347. 1909.

Type locality, "Azufrora near Saltillo." Type collected September 22, 1848, *Gregg* 511.

**4. Allionia violacea** L. Syst. ed. 10. 890. 1759.

*Oxybaphus violaceus* Choisy, Prodr. **13²:** 432. 1849.
*Oxybaphus violaceus parviflorus* Choisy, loc. cit.
*Mirabilis violacea* Heimerl, Jahresb. Oberrealsch. Fünfhaus **23:** repr. 23. 1897.
Type locality, Cumana, Venezuela.

*Specimens examined:*

YUCATAN: 1903, *Caec. & Ed. Seler* 3996; Chichen Itza, 1895, *Millspaugh* 121; 1895, *Gaumer* 579.
GUATEMALA: Santa Rosa, Depart. Santa Rosa, alt. 770 meters, July, 1892, *Heyde & Lux* 3069; Casillas, Depart. Santa Rosa, alt. 1,230 meters, May, 1893, *Heyde & Lux* 4568; Guatemala, Depart. Guatemala, alt. 1,540 meters, May, 1892, *Shannon* 4718.
HONDURAS: San Pedro Sula, Santa Barbara, 1888, *Thieme* 5624.
COSTA RICA: Nicoya, 1900, *Tonduz* 13935; Nicoya, alt. 200 meters, May 22, 1903, *Cook & Doyle* 641; Bahia de Salmas, 1890, *Pittier* 2755.
SALVADOR: Vicinity of Izalco, Depart. Sonsonate, alt. 400 to 600 meters, February 14, 1907, *Pittier* 1926.

Hemsley gives the following additional locality in Mexico: Tehuantepec, *Andrieux* 127.

**5. Allionia mollis** Standley, sp. nov.

Slender, lax, much branched, about 80 cm. high; stems bright green, glabrous below, above sparingly beset with inconspicuous gland-tipped hairs; leaf blades deltoid-ovate, obtuse, subcordate at the base, thin, bright green, glabrous, on petioles almost as long as the blades; inflorescence slender and weak, few-flowered, corymbosely branched, leafy; involucres 3-flowered, about 5 mm. high, viscid, the lobes obtuse; fruit 3.5 mm. long, acute above, scarcely ribbed, glabrous, blackish brown.

Type in the National Herbarium, no. 460695, collected on ledges at El Salto, State of Mexico, altitude 2,150 meters, September 18, 1902, by C. G. Pringle (no. 11337). While closely related to *A. violacea* it may readily be distinguished by its narrower, obtuse leaves and by the numerous gland-tipped hairs of the stem, besides which it is a larger plant and more branched.

**6. Allionia cardiophylla** Standley, sp. nov.

Plants stout, 70 to 90 cm. high; stems glabrous below, more or less puberulent above and about the nodes, sparingly branched; leaf blades ovate, acute, cordate at the base, glabrous, rather thick and fleshy, on petioles one-fourth to two-thirds as long; petioles puberulous; inflorescence corymbose, the branches widely spreading; involucres almost 5 mm. high, hispidulous, mostly 3-flowered; fruit sometimes strigillose when young but becoming glabrous, conspicuously verrucose.

Type in the U. S. National Herbarium, no. 566116, collected 6 miles above Dominguillo, Oaxaca, altitude 1,380 to 1,690 meters, October 30, 1894, by E. W. Nelson (no. 1830).

**7. Allionia deltoidea** Standley, sp. nov.

Stems slender, erect, 30 to 40 cm. high, much branched, the branches ascending, glabrous except about the inflorescence, there somewhat viscid, the pubescence disposed in 2 lines along the stem; leaf blades deltoid-ovate, 20 to 35 mm. long and 10 to 16 mm. wide, usually truncate at the base but sometimes subcordate, acute, glabrous or slightly puberulent, rather fleshy, bright green; petioles one-third to one-half as long as the blades, villous; inflorescence irregularly paniculate or cymose, sparingly branched; involucres 3-flowered, short-pediceled, some solitary in the axils of the leaves, about 7 mm. high, divided two-thirds of the way to the base or more, the lobes oblong-ovate, obtuse, abundantly white-villous especially along the margins; perianth about 9 mm. long and 15 mm. wide, almost or quite glabrous; fruit dark brown, 3 mm. long, the ribs narrow and tuberculate-roughened, the spaces between them rather broad and slightly rugulose transversely, glabrous or rarely minutely strigillose.

Type in the U. S. National Herbarium, no. 266904, collected by E. W. Nelson at La Ventura, Coahuila, August 2 to 5, 1896 (no. 3923). The plant suggests *A. melanotricha* but the glabrous fruit and the long, villous pubescence of the involucres readily distinguish it. From *A. cardiophylla* it may be separated by the smaller leaves not cordate at the base, the smaller size of the plant, and the larger flowers.

**8. Allionia texensis** (Coulter) Small, Fl. Southeast. U. S. 406. 1903.

*Oxybaphus glabrifolius* Torr. Bot. Mex. Bound. 168. 1859, not Vahl.

*Allionia corymbosa texensis* Coulter, Contr. Nat. Herb. **2:** 351. 1894.

*Oxybaphus texensis* Weatherby, Proc. Amer. Acad. **45:** 425. 1910.

Type locality, "Valleys near the Rio Grande, below El Paso," Texas.

A specimen in the Gray Herbarium collected at San Miguel El Grande, December, 1827, *Berlandier* 1314, certainly belongs here. Just where this particular locality is I have not been able to determine. The species was also collected by Dr. J. N. Rose at San Juan Capistrano, Zacatecas, August 22, 1897 (no. 2474).

**9. Allionia microchlamydea** Standley, sp. nov.

Plants 40 to 70 cm. high; stems glabrous below, sparingly viscid-puberulent above; leaf blades glabrous, 50 to 60 mm. long and 15 mm. wide or less, lanceolate, obtuse, subcordate at the base, rather thick and fleshy; lower leaves long-petioled and even

the uppermost with distinct although short petioles; inflorescence corymbosely much branched; involucres very numerous, short-pediceled, 4 mm. high or less, 1-flowered, rather densely hispidulous; fruit glabrous, almost 3 mm. long, irregularly rugulose.

Type in the U. S. National Herbarium, no. 470249, collected in rocky soil near Ixmiquilpan, Hidalgo, July, 1903, by C. A. Purpus (no. 429).

*Additional specimens examined:*

QUERÉTARO: Between El Ciervo and San Juan, August 29, 1905, *Altamirano* 1769.

Related to *A. corymbosa* but differing in its more numerous and smaller involucres and narrower leaves.

**10. Allionia corymbosa** (Cav.) Kuntze, Rev. Gen. Pl. 533. 1891.

*Mirabilis corymbosa* Cav. Icon. Pl. **4:** 55. *pl. 379*. 1797.
*Calyxhymenia glabrifolia* Orteg. Hort. Matr. Dec. **5:** *pl. 1a*. 1797.
*Calymenia corymbosa* Pers. Syn. Pl. **1:** 37. 1805.
*Oxybaphus glabrifolius* Vahl. Enum. Pl. **2:** 40. 1806.
Type locality, "Habitat in Nova Hispania."

*Specimens examined:*

HIDALGO: Near El Salto, September 16, 1903, *Rose & Painter* 7100; on Sierra de la Mesa, 1905, *Rose, Painter & Rose* 9102.
COAHUILA: Vicinity of Saltillo, June, 1898, *Palmer* 326.
SAN LUIS POTOSÍ: Vicinity of San Luis Potosí, 1878, *Parry & Palmer* 769; same locality, 1898, *Palmer* 644; San Luis Potosí, 1879, *Schaffner* 468.
AGUASCALIENTES: Near Aguascalientes, October 9, 1903, *Rose & Painter* 7732.
COAHUILA OR NUEVO LEON: 1880, *Palmer* 1112.

**11. Allionia glabra recedens** (Weatherby) Standley.

*Oxybaphus glaber recedens* Weatherby, Proc. Amer. Acad. **45:** 425. 1910.

Type locality, "Chihuahua: between Casas Grandes and Sabinal." Type collected by E. W. Nelson (no. 6351), September 4–5, 1899, at an altitude of 1,550 to 1,700 meters.

Only the type collection has been examined from Mexico.

This well-marked form is found in New Mexico and Texas in the Rio Grande Valley, in the Pecos Valley of New Mexico, in various parts of western Texas, and in southwestern Kansas. It seems probable that the specimens collected by Pringle on sand hills near Paso del Norte, Chihuahua, in 1886 (no. 1126), belong here as well, although I have not seen the specimens since the publication of the subspecies. The involucres of the form are often 2-flowered, and in the National Herbarium is a specimen to which Dr. Heimerl gave the name *biflora* on this account. Very often, although not always, the flowers are cleistogamous. The species proper seems to be restricted to southeastern Utah and northeastern Arizona.

**12. Allionia gausapoides** Standley, sp. nov.

Stems slender, about a meter high, glabrate below, densely pilose-viscid above; leaf blades sessile, 6 cm. long or less, linear or narrowly linear-lanceolate, tapering at both ends, obtuse, thick and fleshy, somewhat glaucous, pilose throughout when young, ciliate at maturity; inflorescence loosely and openly cymose, with densely pilose-viscid branches; involucres few, clustered at the ends of the branches, 6 or 7 mm. high, densely pilose-viscid, the long pubescence black or tawny, the lobes ovate, acute, half as long as the involucre; flowers 3, the perianth 10 to 12 mm. long, glabrous; anthocarp ellipsoidal, constricted near the base, acute, 4 to 5 mm. long, glabrous, the ribs narrow and smooth, the intercostal spaces coarsely rugulose.

Type in the U. S. National Herbarium, no. 22688, collected in the region of San Luis Potosí, in 1878, by Parry & Palmer (no. 768). A plant unique in its combination of narrow leaves, glabrous fruit, and densely pilose stem and involucres.

**13. Allionia divaricata** Rydb. Bull. Torrey Club **29:** 691. 1902.

Type locality, "Durango," Colorado.

*Specimens examined:*

DURANGO: Durango, 1896, *Palmer* 925; Durango, 1898, *Nelson* 4621.

**14. Allionia linearis** Pursh, Fl. Amer. Sept. **2:** 728. 1814.
*Calymenia angustifolia* Nutt. Gen. Pl. **1:** 26. 1818.
*Oxybaphus angustifolius* Sweet, Hort. Britt. **1:** 334. 1827.
*Oxybaphus angustifolius linearis* Choisy in DC. Prodr. **13²:** 433. 1849.
*Mirabilis angustifolia* MacM. Met. Minn. Val. 216. 1892.
*Allionia bushii* Britton, Bull. Torr. Club **22:** 223. 1895.
*Mirabilis nyctaginea angustifolia* Heimerl, Jahresb. Oberrealsch. Fünfhaus **23:** repr. 22. 1897.
*Mirabilis linearis* Heimerl, Ann. Cons. Jard. Genève **5:** 186. 1901.
*Allionia montanensis* Osterhout, Muhlenbergia **1:** 39. 1906.
*Oxybaphus linearis* Robinson, Rhodora **10:** 31. 1908.
*Allionia petrophila* Standley, Contr. Nat. Herb. **12:** 340. 1909.
Type locality, "In Upper Louisiana."

*Specimens examined:*

CHIHUAHUA: Rocky hills near Chihuahua, September, 1886, *Pringle* 340.
SAN LUIS POTOSÍ: Region of San Luis Potosí, 1878, *Parry & Palmer* 767.

I have lately had the opportunity of examining the type of this species in the Pursh herbarium, now in the herbarium of the Academy of Natural Sciences of Philadelphia. It was collected by Bradbury and bears the locality "Louisiana." Its leaves are rather wide and bright green; the inflorescence is rather sparse and narrow, some of the involucres being axillary; it resembles very much the plant named *Allionia glandulifera* by Prof. Aven Nelson and I think that that species must be considered a synonym of *A. linearis*. The type of *Calymenia angustifolia* was also examined in the herbarium of the same institution. This and *A. linearis* are certainly the same. Specimens of the type collection of *A. petrophila* in the National Herbarium have manifestly pubescent fruit and it appears best to reduce that name to synonymy.

**15. Allionia aggregata** (Orteg.) Spreng. Syst. Veg. **1:** 384. 1825.
*Calyxhymenia aggregata* Orteg. Hort. Matr. Dec. **3:** 81. *pl. 11*. 1798.
*Mirabilis aggregata* Cav. Icon. Pl. **5:** 22. *pl. 437*. 1797, as to name only.
*Oxybaphus aggregatus* Vahl, Enum. Pl. **2:** 41. 1806, in part.
*Calymenia aggregata* Pers. Syn. Pl. **1:** 37. 1805.
*Allionia hirsuta aggregata* A. Nelson, New Man. Rocky Mount. 173. 1910.
Type locality, "In Nova Hispania." "Floret in Reg. Hort. Matrit. mense Augusto et Septembri e seminibus missis per D. Sessé."

No specimens of this have been seen. There is little doubt but that it is a young form of some of the Mexican species listed elsewhere. The plate illustrates a plant with axillary inflorescence, narrowly elliptic leaves, and hirsute stem. The only specimens seen by the writer that could be referred here were collected in the north-central part of the United States and are almost certainly immature or poorly grown plants of *Allionia hirsuta*. Professor Nelson has properly referred to them as a subspecific form of that species. True *A. aggregata*, however, is doubtless something very different.

**16. Allionia brandegei** Standley, Contr. Nat. Herb. **12:** 346. 1909.
Type locality, "In the Providence Mountains, California." Type collected by T. S. Brandegee, June 2, 1902.

*Specimens examined:*

BAJA CALIFORNIA: Cantillas Mountains, July, 1884, *Orcutt*.

**17. Allionia pseudaggregata** (Heimerl) Standley, Contr. Nat. Herb. **12:** 356. 1909.
*Mirabilis pseudaggregata* Heimerl, Ann. Cons. Jard. Genève **5:** 183. 1901.
*Mirabilis pseudaggregata subhirsuta* Heimerl, op. cit. 184.
*Mirabilis pseudaggregata eglandulosa* Heimerl, loc. cit.
*Allionia pseudaggregata subhirsuta* Standley, Contr. Nat. Herb. **12:** 356. 1909.
*Oxybaphus pseudaggregatus* Weatherby, Proc. Amer. Acad. **45:** 425. 1910.

Type locality, "State of Chihuahua, cool slopes, Mts. near Chihuahua." Type collected by C. G. Pringle (no. 793).

*Specimens examined:*

CHIHUAHUA: Type collection.

SAN LUIS POTOSÍ: 1873, *Parry & Palmer* 763; San Miguelito Mountain near San Luis Potosí, 1876, *Schaffner* 177.

MEXICO: Valley of Mexico, Guadalupe, August 1, 1861, *Bourgeau* 651.

DURANGO: Durango, 1896, *Palmer* 267.

QUERÉTARO: Del Ciervo al cerro de la mesa, August 20, 1905, *Altamirano* 1591 and 1604.

Doctor Heimerl described the species as occurring in two forms, *subhirsuta* and *eglandulosa*. Both were described from Pringle's 793 and are to be considered as belonging to the same species, not even differing in a subspecific way. The two specimens from Querétaro are perhaps distinct; they have narrower leaves and more abundant pubescence than the type, while the involucres seem slightly different. The fruit is exactly the same, however, and it seems unwise to separate them, especially since the material is of unsatisfactory quality.

As a synonym of this species, with but little doubt, should be placed *Mirabilis aggregata* Cav.[a] The plant figured has stems glabrous, at least below, lanceolate leaves, axillary inflorescence, and cleistogamous flowers. It is probably a young plant of this species. The name has been cited as a synonym of *Allionia decumbens* Nutt., which seems to have been based upon a young plant of *A. lanceolata* Rydb. or possibly even of *A. linearis*. No Allionia of the region from which *A. decumbens* was described extends into that part of Mexico where *Mirabilis aggregata* Cav. was found, hence the two can not be synonymous. Cavanilles gives the source of his plant as "In viciniis Sancti Augustini de las Cuevas in Nova Hispania." This locality is in the immediate vicinity of the City of Mexico, the locality where Bourgeau's specimen listed above was collected.

**18. Allionia trichodonta** Standley, Contr. Nat. Herb. **12:** 354. 1909.

Type locality, "Ixmiquilpan, Hidalgo." Type collected in 1905 by C. A. Purpus.

*Specimens examined:*

HIDALGO: Type specimen.

**19. Allionia coahuilensis** Standley, Contr. Nat. Herb. **12:** 347. 1909.

*Oxybaphus coahuilensis* Weatherby, Proc. Amer. Acad. **45:** 425. 1910.

Type locality, "Saltillo, Coahuila." Type collected in 1898, *Palmer* 158.

Here can be placed, temporarily at least, Purpus's 3932, collected at the Cerro de Chicamale, Puebla, August, 1909.

**20. Allionia greggii** Standley, Contr. Nat. Herb. **12:** 348. 1909.

Type locality, "San Antonio, near Saltillo." Type collected by Gregg, September 1, 1848 (no. 394b).

**21. Allionia suffruticosa** Standley, sp. nov.

Low, much branched; stems slender, woody below and glabrous, puberulous and viscid above; leaf blades small, yellowish green, glabrous, deltoid-ovate, acutish, all on slender petioles about one-fourth as long; inflorescence corymbosely branched, the rather few involucres 5 mm. high, 3-flowered, densely hispidulous, their lobes acute; perianth twice as long as the involucre, purplish red; fruit 5 mm. long, hirtellous, the ribs broad and smooth.

Type in the U. S. National Herbarium, no. 841004, collected at Los Naranjos, Oaxaca, June, 1908, by C. A. Purpus (no. 3378). I have seen no other Allionia with a truly woody stem. The plant in habit and general appearance strongly suggests some of the species of Hesperonia.

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[a] Icon. Pl. **5**: 22. *pl. 437*. 1799.

**22. Allionia foliosa** Standley, sp. nov.

Stems slender, glabrous, 30 to 40 cm. high, branched at the base and sparingly above; leaves numerous, the internodes very short; blades thin, glabrous, ovate or lance-ovate, 40 to 60 mm. long and 18 to 30 mm. wide, rounded at the base, acute; petioles slender, 5 to 12 mm. long; inflorescence cymose with but few branches, these finely viscid-puberulent and furnished with numerous viscid, much reduced, bract-like leaves; involucres few, usually 1-flowered, conspicuously villous and ciliate when young, but becoming almost glabrous, the lobes ovate, acute, the whole 6 to 11 mm. high, on pedicels 4 to 6 mm. long; fruit 6 mm. long, finely puberulous, with broad and smooth ribs.

Type in the U. S. National Herbarium, no. 229205, collected by E. W. Nelson between San Gerónimo and La Venta, Oaxaca, altitude about 60 meters, July 13, 1895 (no. 2787). The plants suggest some of the forms that have passed as *Allionia floribunda*, but their inflorescence is very different; they are related to *A. latifolia*, but differ decidedly in the form of the leaves and involucres.

**23. Allionia melanotricha** Standley, Contr. Nat. Herb. **12**: 351. 1909.

*Mirabilis nyctaginea alpicola* Heimerl, Jahresb. Oberrealsch. Fünfhaus **23**: repr. 23. 1897.

*Mirabilis nyctaginea cervantesii* Heimerl, loc. cit., as to material, not *A. cervantesii* Steud.

*Oxybaphus melanotrichus* Weatherby, Proc. Amer. Acad. **45**: 425. 1910.

Type locality, "Barfoot Park, in the Chiricahua Mountains, Arizona." Type collected by J. C. Blumer, 1907 (no. 1385).

*Specimens examined:*

SONORA: San José Mountains, August 3, 1893, *Mearns* 1586.

CHIHUAHUA: Near Colonia Garcia in the Sierra Madre, August 3, 1899, *Townsend & Barber* 244; near Colonia Garcia, August, 1899, *Nelson* 6177; mountains near Pilares, September 23, 1891, *Hartman* 743; Soldier Canyon, Sierra Madre, alt. 2,000 meters, September 16, 1903, *Jones*.

COAHUILA or NUEVO LEÓN: 1880, *Palmer* 1111.

DURANGO: Vicinity of Durango, 1896, *Palmer* 261.

*Allionia melanotricha* is one of the most variable species of the genus. The leaves vary in outline from ovate-cordate to lance-oblong and cuneate at the base; the black hairs of the involucre, so characteristic in some parts of the range, are often lacking in specimens from other regions.

## OTHER SPECIES REPORTED FROM MEXICO.

**Allionia cervantesii** (Sweet) Steud. Nom. Bot. ed. 2. **1**: 50. 1840.

More than once this species has been cited from Mexico and even from the United States. A large part of the material thus referred to is *Allionia melanotricha;* some, especially that from Mexico, is referable to other species. Sweet based his species upon cultivated plants grown from South American seed. Doctor Heimerl cites a specimen collected by Ehrenberg at "Minl. del Monte bei Huasca" as belonging to this species. The writer has seen no Mexican material that can be placed here.

**Allionia ovata** (Ruiz & Pav.) Standley.

*Calyxhymenia ovata* Ruiz & Pav. Fl. Peruv. Chil. **1**: 45. *pl. 75. f. b.* 1798.

*Oxybaphus ovatus* Vahl, Enum. Pl. **2**: 41. 1806.

*Allionia ovata* Pursh is a very different plant, while it is long antedated by the name of Ruiz and Pavon. The proper combination under Allionia seems never to have been made.

Questioningly referred to Mexico by Choisy, but we have seen no specimens from North America. The species is South American.

**Allionia cordifolia** (Kunze) Kuntze, Rev. Gen. Pl. 533. 1891.

Mentioned by Choisy and Hemsley as occurring within our limits, but the species is a South American one and has not been collected in North America so far as our herbarium material shows.

**Allionia linearifolia** (S. Wats.) Kuntze, Rev. Gen. Pl. 533. 1891.

*Oxybaphus linearifolius* S. Wats. Proc. Amer. Acad. **17:** 375. 1882.

*Allionia gracillima* Standley, Contr. Nat. Herb. **12:** 340. 1909.

I have seen no specimens of this species from Mexico, but during the summer of 1910 Mr. J. C. Blumer collected excellent specimens in Arizona, only a few miles from the boundary. As he says in a letter received recently, the species will probably be found farther south, on the Mexican side of the boundary.

## 15. **QUAMOCLIDION** Choisy.

*Quamoclidion* Choisy in DC. Prodr. **13**[2]**:** 429. 1849.

Type species, *Mirabilis triflora* Benth.

Quamoclidion as originally published consisted of two species, *Q. nyctagineum* and *Q. angulatum*. *Nyctago angulata* DC. was quoted as a synonym of the second species, which has never been identified. The specimens upon which it was based came from Mexico. It has been suggested that the plant is *Allioniella oxybaphoides*, but the description does not altogether agree with that genus nor has Allionella ever been found in Mexico so far as can be determined. It is not improbable that it is found in some of the mountains of northern Chihuahua, but Choisy's specimens were collected by Mociño and Sessé much farther south.

According to the description the characters of the plant are: Stem slender; leaves petioled, cordate, acute, repand-angled; peduncles from axils of the upper leaves scarcely surpassing them; involucres 5-lobed, 3-flowered, campanulate; flowers sessile, reddish; perianth short-tubular, dilated and 5-toothed at the apex; stamens long-exserted; stigma multifid; fruit obovate, not rugose.

A tracing of Mociño and Sessé's drawing seems not to agree with Choisy's description in all particulars. It represents a plant with 1-flowered involucres. The lobes of the perianth are ovate and acute. In the dissection of the flower it is represented as having 5 stamens, while in other flowers upon the branches the number of stamens runs from 6 to 8. The drawing suggests an Allionia, but I have seen nothing that resembles it even remotely.

### KEY TO THE SPECIES.

Perianth 25 mm. long or less, with a very narrow limb..... 1. *Q. triflorum.*
Perianth 40 to 50 mm. long, with a broad and conspicuous limb.
  Fruit dark brown to black; stems glabrous, at least below.... 2. *Q. multiflorum.*
  Fruit light brown, marked with 10 dark, vertical lines; stems usually pubescent throughout..... 3. *Q. froebelii.*

1. **Quamoclidion triflorum** (Benth.) Standley, Contr. Nat. Herb. **12:** 358. 1909.

*Mirabilis triflora* Benth. Pl. Hartweg. 23. 1839.

*Quamoclidion nyctagineum* Choisy in DC. Prodr. **13**[2]**:** 429. 1849.

Type locality, Mexico.

*Specimens examined:*

BAJA CALIFORNIA: From Cerro Colorado to Rodriguez, alt. 245 to 430 meters, December 16, 1905, *Nelson & Goldman* 7324; from Miraflores to San Bernardo Ranch in Sierra La Laguna, alt. 735 meters, January 20, 1906, *Nelson & Goldman* 7414; Triumfo, October 24, 1890, *Brandegee* 479; Pescadero, November, 1902, *Brandegee*; Todos Santos, 1890, *Brandegee.*

MEXICO: No locality given, *Hartweg* 197, type collection.



QUAMOCLIDION MULTIFLORUM TORR.

Although *Mirabilis triflora* Benth. was the type of Choisy's genus, in transferring the plant to Quamoclidion he changed the specific name so that his combination was *Quamoclidion nyctagineum*.

**2. Quamoclidion multiflorum** Torr.; A. Gray, Amer. Journ. Sci. II. **15:** 321. 1853.
PLATE 77.

*Oxybaphus multiflorus* Torr. Ann. Lyc. N. Y. **2:** 237. 1828.
*Nyctaginia? torreyana* Choisy in DC. Prodr. **13²:** 430. 1849.
*Mirabilis multiflora* A. Gray, Bot. Mex. Bound. 173. 1859.
Type locality, "About the forks of the Platte," Colorado.

No Mexican specimens of this species have been seen, but it certainly occurs in the Rio Grande Valley near Ciudad Juárez, Chihuahua. It is one of the most ornamental plants of the family, rivaling the related *Mirabilis jalapa*, and would lend itself well to cultivation.

The photograph was taken at Agricultural College, New Mexico, by E. O. Wooton and Paul C. Standley.

**3. Quamoclidion froebelii** (Behr) Standley, Contr. Nat. Herb. **12:** 359. 1909.
*Oxybaphus froebelii* Behr, Proc. Calif. Acad. **1:** 69. 1855.
*Mirabilis multiflora pubescens* S. Wats. Bot. Calif. **2:** 2. 1880.
*Mirabilis froebelii* Greene, Bull. Calif. Acad. **1:** 124. 1885.
*Mirabilis multiflora froebelii* M. E. Jones, Contr. Western Bot. **10:** 49. 1902.
Type locality, "Culta e seminibus a J. Froebel prope Warner's Ranch lectis." Warner's Ranch was in southern California.

*Specimens examined:*

BAJA CALIFORNIA: Between the Tia Juana River and Laguna, June 9, 1894, *E. A. Mearns* 3506.
MEXICO: No locality given, *Doctor Coulter* 1327.

## 16. HESPERONIA Standley.

*Hesperonia* Standley, Contr. Nat. Herb. **12:** 360. 1909.
Type species, *Mirabilis californica* A. Gray.

### KEY TO THE SPECIES.

Fruit spherical.
- Plants scabrate, especially on the leaves and inflorescence..... 1. *H. cedrosensis.*
- Plants glandular-pubescent, never scabrate..... 2. *H. heimerlii.*

Fruit oblong or ellipsoidal.
- Plants large and stout; leaves 5 cm. long or less; lobes of the involucre narrowly lanceolate..... 3. *H. tenuiloba.*
- Plants smaller and more slender; leaves not more than half as large as in the above; lobes of the involucre triangular-lanceolate or ovate-lanceolate.
  - Plants glabrous throughout, or the young leaves with a few scattering hairs..... 4. *H. laevis.*
  - Plants not glabrous throughout, the stems at least sparingly pubescent.
    - Fruit almost 8 mm. long, narrow; flowers few and conspicuously pediceled..... 5. *H. oligantha.*
    - Fruit about 4 mm. long or less; flowers more numerous and on short and stout pedicels.
      - Flowers about 12 mm. long; fruit inconspicuously striate..... 6. *H. californica.*
      - Flowers about 2 cm. long; fruit dark brown, not at all striate..... 7. *H. polyphylla.*

**1. Hesperonia cedrosensis** Standley, Contr. Nat. Herb. **12:** 362 .1909.

Type locality, "Cedros Island, Lower California." Type collected April 3, 1897, by T. S. Brandegee.

*Specimens examined:*

BAJA CALIFORNIA: San Benito Island, 1889, *Lieutenant Pond* 23; Cedros Island, March, 1889, *Palmer* 737; same locality, February, 1889, *Palmer;* San Quentin Bay, January, 1889, *Palmer* 640; Cedros Island, 1911, *Rose* 95.

This is easily distinguishable from all other species of the genus by its peculiar pubescence.

**2. Hesperonia heimerlii** Standley, sp. nov.

Stems stout, glaucous, glabrous, tortuous, much swollen at the nodes, with many divaricate branches; leaf blades deltoid-ovate, the largest 35 mm. long and 30 mm. wide, most of them smaller, thick and fleshy, cordate at the base, obtuse or acutish, usually glabrous but some of the uppermost glandular-puberulent; petioles half as long as the blades or those of the upper ones much shorter; involucres numerous, short-peduncled in the axils of the leaves or congested at the ends of the branches, 6 mm. high, cleft halfway to the base, the lobes triangular, densely glandular-pubescent; perianth 10 mm. long or less; fruit glabrous, spherical or slightly compressed vertically, 2.5 to 3 mm. in diameter, dark brown.

Type in the U. S. National Herbarium, no. 22626, collected by Dr. Edward Palmer at the south end of Guadalupe Island, Baja California, March 30, 1889 (no. 886). Additional material was collected by Dr. F. Franceschi on the same island in 1893, and by J. N. Rose in 1911 (no. 21).

The form of the fruit places this plant near *H. cedrosensis*, but the pubescence is very different. The specimens in the National Herbarium were labeled as a new species of Mirabilis by Doctor Heimerl.

**3. Hesperonia tenuiloba** (S. Wats.) Standley, Contr. Nat. Herb. **12:** 363. 1909.

*Mirabilis tenuiloba* S. Wats. Proc. Amer. Acad. **17:** 375. 1882.

Type locality, "San Bernardino County, California." Type collected by W. G. Wright in 1880.

*Specimens examined:*

BAJA CALIFORNIA: Signal Mountain, Colorado Desert, 1901, *Brandegee;* pass in Cucopa Mountains, April 7, 1905, *MacDougal* 170; base of Cucopa Mountains, April 5, 1905, *MacDougal* 125.

**4. Hesperonia laevis** (Benth.) Standley, Contr. Nat. Herb. **12:** 363. 1909.

*Oxybaphus laevis* Benth. Bot. Voy. Sulph. 44. 1844.

*Mirabilis laevis* Curran, Proc. Calif. Acad. II. **1:** 235. 1889.

*Quamoclidion laeve* Rydb. Bull. Torrey Club **29:** 687. 1902, as to name, not material.

Type locality, "Bay of Magdalena," Baja California.

*Specimens examined:*

BAJA CALIFORNIA: Magdalena Bay, *Lung* 28; Magdalena Island, January 18, 1889, *Brandegee.*

**5. Hesperonia oligantha** Standley, Contr. Nat. Herb. **12:** 363. 1909.

Type locality, "Calmalli, Lower California." Type collected in 1898, C. A. Purpus 82.

No further material of this species has been seen.

**6. Hesperonia californica** (A. Gray) Standley, Contr. Nat. Herb. **12:** 364. 1909.

*Oxybaphus glabrifolius crassifolius* Choisy in DC. Prodr. **13**$^{2}$**:** 431. 1849.

*Oxybaphus glabrifolius* Torr.U. S. Rep. Expl. Miss. Pacif. **4:** 131. 1857, not Vahl.

*Mirabilis californica* A. Gray, Bot. Mex. Bound. 173. 1859.

*Oxybaphus californicus* Benth. & Hook. Gen. Pl. **3:** 4. 1880.

Type locality, none given.

*Specimens examined:*

BAJA CALIFORNIA: Aguaje de San Esteban, 25 miles north of San Ignacio, altitude 370 meters, October 5, 1905, *Nelson & Goldman*, 7202; northern Lower California, April 12, 1882, *Orcutt*.

**6a. Hesperonia californica microphylla** Standley, Contr. Nat. Herb. **12:** 365. 1909

Type locality, "San Martin Island, Lower California." Type collected by T. S. Brandegee, March 12, 1897.

*Specimens examined:*

BAJA CALIFORNIA: Ensenada, April 26, 1893, *Brandegee*.

**7. Hesperonia polyphylla** Standley, Contr. Nat. Herb. **12:** 364. 1909.

Type locality, "San Borga, Lower California." Type collected by T. S. Brandegee, May 6, 1889.

*Specimens examined:*

BAJA CALIFORNIA: Los Angeles Bay, 1887, *Palmer* 600.

## 17. MIRABILIS L.

*Mirabilis* L. Sp. Pl. 177. 1753.
*Nyctago* Juss. Gen. Pl. 90. 1789.
Type species, *Mirabilis jalapa* L.

The Mexican species of Mirabilis include almost the entire genus; a few other species have been described from South America.

### KEY TO THE SPECIES.

Stamens 3; anthocarp constricted near the base, viscid when moistened. (Perianth not expanding into a limb)..... 1. *M. watsoniana*.
Stamens 5; anthocarp not constricted near the base, not viscid when moistened.
  Stamens twice as long as the perianth or more, the latter tubular or with a very narrow limb; lobes of the involucre obtuse.
    Perianth somewhat dilated at the base, 4 mm. in diameter, scarcely at all dilated above..... 2. *M. pringlei*.
    Perianth not dilated at the base, 2 mm. or less in diameter, gradually dilated above..... 3. *M. exserta*.
  Stamens considerably less than twice as long as the perianth; lobes of the involucre acute. (Limb of the perianth broader and more conspicuous.)
    Perianth trumpet-shaped, gradually dilated from base upward, 22 mm. long or less. (Angles of the anthocarp verrucose)..... 4. *M. urbani*.
    Perianth salverform, rather abruptly dilated into a spreading limb, 30 mm. long or more.
      Perianth 3 to 5 cm. long, red, yellow, or rarely white, the tube dilated upward, not conspicuously elongated.
        Leaves usually subcordate at the base; petioles short; involucre glabrate in age, 6 to 10 mm. long, the lobes oblong-lanceolate, long-acuminate, puberulent on the margins; tube of perianth glabrous or almost so; stamens equalling or longer than the perianth; style 35 to 50 mm. long..... 5. *M. jalapa*.

Leaves usually truncate at the base; petioles half to two-thirds as long as the blades in the lower leaves; involucre puberulent, finally 10 to 12 mm. long, the lobes ovate or lanceolate, shortly acuminate, ciliate; tube of perianth pilose; stamens 10 to 20 mm. longer than the perianth; style about 65 mm. long ..... 5a. *M. jalapa odorata.*

Perianth 10 to 15 cm. long, white; tube long-tubular, much elongated.

Stems densely glandular above; leaf-blades glandular on both surfaces, the upper ones sessile, usually not long-attenuate ..... 6. *M. longiflora.*

Stems almost glabrous above, not glandular; leaf blades glabrous, all petioled, usually long-attenuate. (Tube of the perianth more slender)..... 7. *M. wrightiana.*

**1. Mirabilis watsoniana** Heimerl, Bot. Jahrb. Engl. **11:** 84. *pl. 2. f. 2a–2h.* 1889.

Type locality, "In republica Guatemalensi Americae Centralis ad 'Cuesto de Solola.'" Type collected by Bernouilli & Cario, June, 1877 (no. 2616).

Plant with the habit of *M. jalapa;* a low herb, probably perennial; stems erect from a subdecumbent base, divaricately branched, above puberulent and densely leafy, below glabrate; leaf blades cordate or truncate at the base, acuminate and acute, the upper subtending the flowers subsessile, the others long-petioled, shortly attenuate to the petiole, thin, green on both surfaces, sparingly hirtellous on the margins, elsewhere glabrous; flowers clustered in cymes at the ends of the branches, on slender, pubescent peduncles; involucres 1-flowered, tubular-campanulate, unequally 5-toothed, hirtellous, after anthesis slightly enlarged; basal part of the perianth, including the ovary, obovate, sparingly hirtellous, 5-nerved, the upper part from the base to about the middle very narrowly tubular, above gradually dilated into a wide tube slightly constricted below the mouth, hirtellous without, with a scarcely expanded 5-lobed limb; stamens 3, like the style long-exserted, subequal; anthocarp small, dark, shorter than the involucre, obovate-pyramidal, above shortly apiculate, the apex itself obtuse, distinctly constricted above the broad, subtruncate base, 5-angled, the angles slightly tuberculate, elsewhere smooth, hirtellous, slightly viscid when moistened.

The above description is a translation of the original one, as I have seen no specimens of the plant. The species differs radically from all others of the genus in having but three stamens and in having the anthocarp constricted just above the base much as in Allionia. It was partly at least because of this plant that Doctor Heimerl merged the genera Allionia and Mirabilis into the one, Mirabilis. After examining the plate illustrating the plant, however, it does not seem to the writer that such a treatment is desirable. The species agrees with other members of the genus in the form of the involucre, shape of the perianth, number of flowers in the involucre, and especially in habit and general appearance, in the last two respects being entirely unlike any Allionia. For the species Doctor Heimerl[a] founded the section Watsonia of the genus Mirabilis.

**2. Mirabilis pringlei** Weatherby, Proc. Amer. Acad. **45:** 424. 1910.

Type locality, "Guerrero: under limestone cliffs, Iguala Cañon, alt. 915 m." Type collected by C. G. Pringle, July 23, 1907 (no. 10384).

Only the type specimen has been examined.

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[a] Jahresb. Oberrealsch. Fünfhaus Wien **23:** repr. 20. 1897.

**3. Mirabilis exserta** Brandegee, Proc. Calif. Acad. II. **3:** 165. 1891.

Type locality, "Summits of the spurs of Sierra de San Francisquito," Baja California.

*Specimens examined:*

BAJA CALIFORNIA: Type specimen; La Chuparosa, 1899, *Brandegee.*

**4. Mirabilis urbani** Heimerl, Oesterr. Bot. Zeitschr. **56:** 250. 1906.

Type locality, "In Mexico australi ad San Salvador, 650 m. s. m." Type collected by E. Langlassé in 1898 (no. 240). The locality is either in Michoacan or Guerrero.

*Specimens examined:*

MICHOACAN or GUERRERO: Campo Morado, June 14, 1899, *Langlassé* 1058.

A plant closely related to *M. jalapa* but differing in the form of the involucre and anthocarp, and in the smaller perianth and more abundant pubescence.

**5. Mirabilis jalapa** L. Sp. Pl. 177. 1753.

*Jalapa congesta* Moench, Meth. Pl. 508. 1794.
*Nyctago jalapae* DC. & Lam. Fl. Franç. **3:** 426. 1805.
*Mirabilis planiflora* Trautv. Bull. Sci. Acad. St. Pétersb. **6:** 216. 1840.
*Mirabilis ambigua* Trautv. Linnaea **1841:** Litt.-Ber. 97. 1841.
*Mirabilis pubescens* Zipp.; Spanoghe, Linnaea **15:** 342. 1841.
*Mirabilis jalapa ambigua* Choisy in DC. Prodr. **13²:** 428. 1849.
*Mirabilis jalapa planiflora* Choisy, loc. cit.
*Mirabilis jalapa volcanica* Standley, Contr. Nat. Herb. **12:** 367. 1909.
*Mirabilis jalapa gracilis* Standley, loc. cit.
*Mirabilis jalapa lindheimeri* Standley, op. cit. 368.
*Mirabilis jalapa ciliata* Standley, loc. cit.

Type locality, "In India utraque."

*Specimens examined:*

COAHUILA: Saltillo, 1848, *Gregg* 344.
SAN LUIS POTOSÍ: Region of San Luis Potosí, 1878, *Parry & Palmer* 775.
DURANGO: Vicinity of Durango, 1896, *Palmer* 630 and 631.
MEXICO: Zocoalco près Mexico, 1861, *Bourgeau* 617; Pedregal, Valley of Mexico, alt. 2,270 meters, August 19, 1896, *Pringle* 6433.
YUCATAN: *Gaumer* 548.
OAXACA: Oaxaca Valley, alt. 1,530 meters, October 1, 1894, *C. L. Smith* 791; Valley of Oaxaca, alt. 1,530 to 1,630 meters, September 20, 1894, *Nelson* 1314.
NUEVO LEÓN: Monterey, *Edwards & Eaton.*
CHIAPAS: Between San Richardo and Ocozucuantla, alt. 800 to 1,010 meters, August 18, 1895, *Nelson* 2987.
VERA CRUZ: Orizaba, *Botteri* 582.
TEPIC: Near Santa Teresa, August 8, 1897, *Rose* 2131.
SINALOA: Waste ground, Mazatlan, March 31, 1910, *Rose, Standley & Russell* 13767.
PANAMA: Gatun, March 4, 1905, *Cowell* 311.

*Additional localities cited by Hemsley and by Heimerl:*

GUATEMALA: Dueñas, alt. 1,530 meters, *Salvin.*
NICARAGUA: Realejo, *Sinclair.*
MEXICO: Bords de fossées près de Mexico, *Bourgeau* 616; environs de Mexico, *Berlandier* 521; Chapulco, *Liebmann; Ehrenberg* 169.

*Mirabilis jalapa* is an exceedingly variable species. There are noticeable differences in the form of the leaves, size of the perianth, and pubescence of stem, leaves, and anthocarp, but the amount of variation is so little that it seems hardly wise to maintain any of the forms even as subspecies with perhaps the exception mentioned below. Because of its frequency in cultivation the common four-o'clock has received

numerous names. Doubtless considerable variation is exhibited by cultivated plants, although these are not apparent in the rather scanty herbarium specimens made from such material. The color of the perianth is one of the most variable characters, ranging through purplish red, white, and yellow, and variegated forms combining these colors.

It was formerly believed that the home of the plant was Peru, whence one of its common names, "marvel of Peru." Heimerl inclines to the belief that the species is native of southern Mexico. From all reports it certainly seems to be indigenous in that region. In other parts of Mexico it has escaped from cultivation. In southern Texas and perhaps in Florida the plant appears to be native, while in other parts of the United States it is merely an escape.

The specific name of *jalapa* was given to the plant because it was believed that its root furnished the jalapa of commerce. This medicinal substance instead is supplied by the root of a plant of a different family. One of the most commonly cultivated ornamental plants of Mexico, the species is there known under several common names, *maravilla*, *arrebolera*, *Don Diego de noche*, and *trompetilla*.

**5a. Mirabilis jalapa odorata** (L.) Heimerl, Bot. Jahrb. Engler **21:** 616. 1896.
*Mirabilis odorata* L. Cent. Pl. **1:** 7. 1755.
*Mirabilis dichotoma* L. Sp. Pl. ed. 2. 252. 1762.
*Jalapa undulata* Moench, Suppl. Meth. Pl. 196. 1802.
*Nyctago hortensis* Juss.; Roem. & Schult. Syst. Veg. **4:** 1. 1819, as synonym.
*Nyctago dichotoma* Juss.; Roem. & Schult. Syst. Veg. **4:** 1. 1819, as synonym.
*Mirabilis parviflora* Targ.-Tozz.; Steud. Nom. Bot. 535. 1821, as synonym.
*Mirabilis divaricata* Lowe, Trans. Cambridge Phil. Soc. 17. 1831.
*Mirabilis procera* Bertol. Nov. Comm. Acad. Bononiensis **3:** 15. *pl. 1.* 1839.
*Mirabilis divaricata uniflora* Choisy in DC. Prodr. **13²:** 428. 1849.
*Mirabilis jalapa procera* Choisy, loc. cit.
Type locality, "Habitat in America."

*Specimens examined:*

GUATEMALA: Escuintla, 1890, *J. D. Smith* 2019; Coban, Alta Verapaz, April, 1889, *J. D. Smith* 1731.
SALVADOR: *Renson* 195.
COSTA RICA: Paraiso, San José, 1896, *J. D. Smith* 6737.

The form is hardly worth maintaining even as a subspecies. Some of the specimens seem fairly distinct from *M. jalapa*, but all sorts of intermediate forms can be found, some of which can be referred equally well to the type or the subspecies. The latter is the common form of the West Indies. Ramírez and Alcocer give as the common names *arrebolera*, *maravilla*, *maravilla silvestre*.

**6. Mirabilis longiflora** L. Vet. Akad. Handl. 176. *pl. 6. f. 1.* 1755.
*Jalapa longiflora* Moench, Meth. Pl. 508. 1794.
*Nyctago longiflora* DC. & Lam. Fl. Franç. **3:** 426. 1805.
*Mirabilis suaveolens* H. B. K. Nov. Gen. & Sp. **2:** 213. 1817.
Type locality, Mexico.

*Specimens examined:*

PUEBLA: Vicinity of San Luis Tultitlanapa, June, 1908, *Purpus* 3374.
OAXACA: Oaxaca, August 15, 1899, *Conzatti* 973.
MORELOS: Barranca near Cuernavaca, alt. 1,530 meters, July 27, 1896, *Pringle* 6377.
CHIHUAHUA: Gallejo Spring, 1846, *Wislizenus* 122.
FEDERAL DISTRICT: Ixtaccihuatl, 1903, *Purpus* 49.
VERA CRUZ: Esperanza, alt. 2,460 meters, August 14, 1891, *Seaton* 493.
GUANAJUATO: Guanajuato, 1880, *Dugès.*

*Mirabilis suaveolens* was described from specimens collected on hills near Guanajuato. It was said to resemble *M. longiflora*, but to have the stem and flowers more viscid and the leaf blades petioled. Undoubtedly it is a synonym of this species.

Quite as showy as *Mirabilis jalapa*, with its sweet-scented white and purple flowers. The plant is well known in Mexico, where it has received such names as *maravilla del jardín*, *pebete*, *suspiros*, *alzoyatic*, and *atzoyatl*, the last two being Aztec.

7. **Mirabilis wrightiana** A. Gray; Britton & Kearney, Trans. N. Y. Acad. Sci. **14:** 28. 1894.

Type locality uncertain.

*Specimens examined:*

SONORA: Guadalupe Canyon, August 27, 1893, *Merton* 2052.

CHIHUAHUA: No locality given, September 10, 1891, *Hartman* 761; Santa Eulalia Plains, September 11, 1885, *Wilkinson;* between Colonia Garcia and Pratt's ranch below Pacheco, August 22–24, 1899, *Nelson* 6278.

COAHUILA: Canyon above Palomas, Saltillo, 1848, *Gregg* 331.

This species should perhaps be reduced to subspecific rank. It differs from *M. longiflora* principally in the amount of pubescence, and there are numerous intergrading forms.

ADDITIONAL SPECIES REPORTED FROM MEXICO.

**Mirabilis hybrida** Lepel. Ann. Mus. Paris **8:** 481. 1806.

*Mirabilis cordata* Brouss.; Roem. & Schult. Syst. Veg. **4:** 2. 1819.

A form described from cultivated material, thought to be a hybrid of *M. jalapa* and *M. longiflora*, since it combines the peculiarities of those two species. The only material seen has been that from cultivated plants in European gardens. It has been stated that the hybrid is found wild, but the writer has seen no such specimens.

**Mirabilis tubiflora** Fries; Heimerl, Jahresb. Oberrealsch. Fünfhaus **23:** repr. 20. 1897.

This appears to be a nomen nudum. There is nothing to indicate to what plant it was applied.

**Mirabilis oaxacae** Heimerl, Jahresb. Oberrealsch. Fünfhaus **23:** repr. 20. 1897.

The name alone was published by Heimerl [a] in 1886. The final description gives simply the following information: "A subspecies or variety with the flowers long-tubular, the limb of the perianth narrow, the involucres short, the fruit more oblong (than in *M. jalapa*) was collected by Franco about Oaxaca in southern Mexico."

## 18. ACLEISANTHES A. Gray.

*Acleisanthes* A. Gray, Amer. Journ. Sci. II. **15:** 259. 1853.

*Pentacrophys* A. Gray, loc. cit.

Type species, *Acleisanthes crassifolia* A. Gray.

Hemsley cites four species of the genus from Mexico, one of them *A. berlandieri*. The specimens upon the authority of which this species was included are here referred to *A. greggii*.

KEY TO THE SPECIES.

Ribs ending above in conspicuous knobs or glands. (Pentacrophys A. Gray)..... 1. *A. acutifolia.*

Ribs not ending above in knobs or glands.

Opposite leaves strongly unequal..... 2. *A. anisophylla.*

Opposite leaves not strongly unequal.

Leaves long-attenuate (triangular-lanceolate; plants mostly glabrous)..... 3. *A. longiflora.*

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[a] Sitzungsb. Akad. Wiss. Math. Naturw. (Wien) **93:** 234.

Leaves not long-attenuate.
Stems hirtellous throughout, the leaf blades puberulent on both surfaces, thick and fleshy..... 3a. *A. longiflora hirtella.*
Stems glabrous; leaf blades glabrous and much thinner..... 4. *A. greggii.*

**1. Acleisanthes acutifolia** Standley, Contr. Nat. Herb. **12:** 370. 1909.

Type locality, "Maxon's Spring, Texas." Type collected by Dr. V. Havard.

*Specimens examined:*

CHIHUAHUA: Santa Eulalia Mountains, August 25, 1885, *Pringle* 671.
COAHUILA: Saltillo, June, 1898, *Palmer* 282.

**2. Acleisanthes anisophylla** A. Gray, Amer. Journ. Sci. II. **15:** 261. 1853.

Type locality, "Prairies of Turkey Creek and Elm Creek, Western Texas." Type collected by Charles Wright (no. 598).

No Mexican specimens of this species have been examined by the writer, but Hemsley states that it was collected in northern Mexico along the Rio Grande by Schott.

**3. Acleisanthes longiflora** A. Gray, Amer. Journ. Sci. II. **15:** 261. 1893.

Type locality, "Valley of the Limpio," Texas. The type is Charles Wright's no. 599.

*Specimens examined:*

CHIHUAHUA: Vicinity of Aldama, May, 1908, *Palmer* 243; near Chihuahua, 1885, *Pringle* 101.
COAHUILA: Vicinity of Saltillo, May, 1898, *Palmer* 181; Parras, 1905, *Purpus* 1056; Saltillo, 1848, *Gregg* 88; Buena Vista, 1847, *Gregg* 355.
COAHUILA or NUEVO LEÓN: 1880, *Palmer* 1116.

The root of this plant is reported to have useful medicinal properties. It is known under the names of *trompetilla* and *yerba de la rabia.*

**3a. Acleisanthes longiflora hirtella** Standley, Contr. Nat. Herb. **12:** 371. 1909.

Type locality, "Near Saltillo, Coahuila." Type collected by Gregg, September 20, 1848 (no. 463).

Only the type specimen has been examined.

**4. Acleisanthes greggii** Standley, Contr. Nat. Herb. **12:** 371. 1909.

Type locality, "Monterey, Mexico." Type collected by Gregg, June 22, 1848 (no. 157).

## 19. BOERHAAVIA L.

*Boerhaavia* L. Sp. Pl. 3. 1753.

Type species, *Boerhaavia erecta* L.

### KEY TO THE SPECIES.

Perennials.
Flowers not in umbels or heads.
Leaves linear or linear-lanceolate..... 1. *B. linearifolia.*
Leaves ovate or oblong.
Flowers clustered, sessile or on very short pedicels; fruit glabrous..... 2. *B. anisophylla.*
Flowers solitary on pedicels 10 mm. long or more; fruit viscid..... 3. *B. gracillima.*
Flowers in umbels or heads.
Stems glandular throughout; clusters of flowers and fruit 6 to 10 mm. in diameter..... 4. *B. viscosa.*

Stems glabrous above or at least not glandular upon the branches of the inflorescence; clusters of flowers and fruit only 2 to 6 mm. broad, often only 4 or 5 flowers in an umbel.

Stems neither hirsute nor villous below..... 5. *B. sonorae.*

Stems more or less hirsute or villous below.

Stems nowhere viscid, more or less hirsute, especially about the nodes, upon the petioles, and margins of the leaf blades..... 6. *B. hirsuta.*

Stems densely viscid-hirsute below..... 7. *B. ixodes.*

Annuals.

Inflorescence spicate.

Anthocarp about as broad as long.

Stems densely villous and viscid; leaves not black-dotted beneath; bracts persistent; anthocarp 4-angled..... 8. *B. wrightii.*

Stems viscid only in rings about the middle of the internodes; leaf blades black-dotted beneath; bracts deciduous; anthocarp 5-angled..... 9. *B. fallax.*

Anthocarp usually twice as long as broad.

Stems densely viscid throughout..... 10. *B. spicata.*

Stems not densely viscid, glabrous at least above.

Anthocarp truncate at the apex..... 11. *B. rosei.*

Anthocarp rounded at the apex.

Perianth 1 mm. long or less; stamens included. (Spikes very slender and few-flowered.)

Ribs of the fruit broad and smooth; stems glabrate; leaf blades thin. 12. *B. watsoni.*

Ribs of the fruit narrow and rugulose; stems viscid-puberulent; leaf blades thicker..... 13. *B. torreyana.*

Perianth 1.5 to 3 mm. long; stamens usually exserted.

Spikes densely flowered; ribs of the fruit thin (perianth 3 mm. long). 14. *B. xanti.*

Spikes with but few flowers, slender, the flowers remote; ribs of the fruit thick and smooth.

Perianth 3 mm. long; leaf blades black-dotted beneath..... 15. *B. alamosana.*

Perianth 1.5 mm. long; leaf blades not black-dotted beneath.. 16. *B. coulteri.*

Inflorescence not spicate.

Anthocarp rounded at the apex, subtended by large, reddish, persistent bracts..... 17. *B. purpurascens.*

Anthocarp truncate or retuse at the apex; bracts small, greenish or whitish, early deciduous.

Anthocarp with 5 conspicuous, thin wings, about as broad as long, retuse at the apex..... 18. *B. alata.*

Anthocarp not with thin wings, angled, the angles sometimes so broad as to be almost wing-like, truncate at the apex.

Anthocarp usually with 3 angles, sometimes with 4.
Inflorescence of axillary or terminal simple umbels..... 19. *B. pterocarpa.*
Inflorescence paniculate..... 20. *B. triquetra.*
Anthocarp 5-angled.
Perianth 2 to 3 mm. long.
Leaf blades linear to lanceolate; anthocarp with thin, wing-like angles..... 21. *B. maculata.*
Leaf blades lanceolate to ovate; angles of the anthocarp thick, narrow, not wing-like..... 22. *B. lateriflora.*
Perianth 1.5 mm. long or less.
Leaf blades ovate (usually black-dotted beneath); flowers in a compound corymb..... 23. *B. erecta.*
Leaf blades lanceolate or oblong; flowers in heads or simple umbels.
Leaf blades lanceolate, black-dotted beneath..... 24. *B. universitatis.*
Leaf blades oblong, not black-dotted beneath..... 25. *B. intermedia.*

**1. Boerhaavia linearifolia** A. Gray, Amer. Journ. Sci. II. **15:** 322. 1853.
Type locality, "Western Texas."

*Specimens examined:*

COAHUILA: Saltillo, May, 1898, *Palmer* 155.
COAHUILA or NUEVO LEÓN: 1880, *Palmer* 1121.

**2. Boerhaavia anisophylla** Torr. Bot. Mex. Bound. 171. 1859.
*Boerhaavia palmeri* S. Wats. Proc. Amer. Acad. **18:** 142. 1883.
Type locality, "Entrance of the Great Cañon of the Rio Grande," Texas.

*Specimens examined:*

COAHUILA: Saltillo, 1880, *Palmer* 1120 (type of *B. palmeri*); vicinity of Saltillo, May, 1898, *Palmer* 156; Mesillas to Saltillo, 1848, *Gregg* 533; west of Cerralvo, 1847, *Gregg* 829.
NUEVO LEÓN: Monterey, 1846, *Edwards & Eaton* 61.
CHIHUAHUA: Santa Eulalia Mountains, August 12, 1885, *Pringle* 685.

It should be noticed that Doctor Watson described two distinct species under the name of *Boerhaavia palmeri* besides a *B. spicata palmeri*. The second species is noted upon page 424 under *Boerhaavia spicata*. The one which is a synonym of *B. anisophylla* was described first, and after it was found to be a synonym the second was described. In the original description of the first *B. palmeri* it is wrongly called an annual.

**2a. Boerhaavia anisophylla micrantha** Heimerl, Ann. Cons. Jard. Genève **5:** 187. 1901.

Type locality, "In campis ad Tehuacán," Puebla. Type collected by Galeotti (no. 581).

No material of this form has been examined. It was described as having flowers much smaller than the species. From the locality in which it is found it should be specifically distinct.

**3. Boerhaavia gracillima** Heimerl, Bot. Jahrb. Engler **11:** 86. *pl. 2. f. 1a–1g.* 1889.

*Boerhaavia anisophylla paniculata* Coulter, Contr. Nat. Herb. **2:** 356. 1894, not *B. paniculata* Rich.

Type locality, "In territorio Mexicano." Type collected by Hartweg (no. 45).

*Specimens examined:*

CHIHUAHUA: Rocky hills near Chihuahua, August 15, 1885, *Pringle* 665; mountains of Cosihuiriachi, 1846, *Wislizenus* 174; vicinity of Chihuahua, alt. 1,300 meters, May, 1908, *Palmer* 199; southwestern Chihuahua, 1885, *Palmer* 663; in the Sierra Madre near Seven Star Mine, alt. 2,150 meters, August 28, 1899, *Townsend & Barber* 379.

BAJA CALIFORNIA: San José del Cabo, 1890, *Brandegee* 487.

SONORA: Guaymas, 1887, *Palmer* 663; Sierra de Alamos, March 15, 1910, *Rose, Standley & Russell* 12874.

AGUASCALIENTES: Near Aguascalientes, August 20, 1901, *Rose & Hay* 6199.

DURANGO: Ramos to Inde, August 11 to 14, 1898, *Nelson* 4688; Durango and vicinity, 1896, *Palmer* 629.

OAXACA: Vicinity of Cuicatlan, alt. 550 to 770 meters, October, 1894, *Nelson* 1604; Tomellín, August 14, 1910, *Hitchcock*.

PUEBLA: Near Tehuacán, September, 1905, *Rose, Painter & Rose* 10145; Tehuacán, August 9, 1910, *Hitchcock*.

HIDALGO: Ixmiquilpan, 1905, *Purpus* 1436.

QUERÉTARO: Querétaro, July 24, 25, 1910, *Hitchcock*.

WITHOUT DEFINITE LOCALITY: Type collection.

In March, 1910, the writer saw the dead plants in abundance in cultivated fields about Hermosillo, Sonora.

In the original description of the species two collections are mentioned, the first being Hartweg's and the other Pringle's 665 from Chihuahua. There is no indication of which was chiefly used in drawing up the description, hence the former should be taken as the type.

**4. Boerhaavia viscosa** Lag. & Rodr. Anal. Cienc. Nat. **4:** 256. 1801.

*Boerhaavia glandulosa* Anderss. Enum. Pl. Galap. 64. 1861.

*Boerhaavia diffusa viscosa* Heimerl, Jahresb. Oberrealsch Fünfhaus **23:** repr. 27. 1897.

Type locality, Peru.

*Specimens examined:*

CHIHUAHUA: Southwestern Chihuahua, 1885, *Palmer* 212; near Chuichupa, September 6, 1899, *Townsend & Barber* 408.

TAMAULIPAS: Vicinity of Victoria, alt. 320 meters, May 6, 1907, *Palmer* 200, 210, 426; Tampico, July 21, 1910, *Hitchcock*.

SINALOA: Mazatlan, June, 1897, *Rose;* near Mazatlan, March 31, 1910, *Rose, Standley & Russell* 13771; gravel beds along the Rio Fuerte, San Blas, March 24, 1910, *Rose, Standley & Russell* 13396; Ymala, September, October, 1891, *Palmer* 1697.

DURANGO: Durango, 1896, *Palmer* 300.

SAN LUIS POTOSÍ: Cárdenas, July 19 and 20, 1910, *Hitchcock*.

ZACATECAS: Near San Juan Capistrano, August 18, 1897, *Rose* 2417; near Concepción del Oro, August, 1904, *Palmer* 290.

TEPIC: Arroyo south of Acaponeta, April 9, 1910, *Rose, Standley & Russell* 14256; Tepic, January, February, 1892, *Palmer;* Acaponeta, February, 1895, *Lamb* 528; Acaponeta, June, 1897, *Rose* 1844.

OAXACA: Valley of Oaxaca, April 2, 1896, *Conzatti & Gonzales* 83; Oaxaca, June 28, 1900, *Deam;* Cuicatlan, September 24, 1894, *L. C. Smith* 197; vicinity of Yalalag, alt. 1,230 to 2,400 meters, July, 1894, *Nelson* 944; valley of Oaxaca, alt. 1,570 to 1,780 meters, September 8, 1894, *Nelson* 1240; Oaxaca Valley, alt. 1,530 meters; October 30, 1894, *C. L. Smith* 774.

COAHUILA: Torreon and vicinity, 1898, *Palmer* 487.
NUEVO LEON: Monterey, October, 1895, *Caec. & Ed. Seler* 1072.
MORELOS: Valley of Cuantla, alt. 1,230 meters, May 30, 1901, *Pringle* 9308; fields near Yautepec, alt. 1,230 meters, May 22, 1904, *Pringle* 13177.
PUEBLA: Tehuacán, 1888, *Caec. & Ed. Seler* 12.
MICHOACAN or GUERRERO: La Orilla, Rives de las Balsas, 1898, *Langlassé* 163.
MEXICO: Environs de Mexico, *Berlandier* 577; near City of Mexico, 1849, *Gregg* 615; Trapiche Concepción, June, *Galeotti* 588; Tizapan, Valley of Mexico, May 23, 1865–6, *Bourgeau* 180.
COLIMA: Acapulco and vicinity, 1895, *Palmer* 308.
YUCATAN: Campeche, *Perrine*.
VERA CRUZ: Vera Cruz, 1853, *Müller* 45.
CHIAPAS: Near Tuxtla, alt. 735 to 780 meters, September 1, 1895, *Nelson* 3103.
GUATEMALA: Jumaytepeque, Depart. Santa Rosa, alt. 1,840 meters, September, 1892, *Heyde & Lux* 4061; Laguna Amatitlán, Depart. Amatitlán, alt. 1,200 meters, February, 1890, *J. D. Smith* 1914; along southern shore of Lake Amatitlán, alt. 1,250 meters, April 10, 1905, *Pittier* 114; Amatitlán, alt. 1,200 meters, October, 1904, *Tuerckheim* 8740; Gualán, Depart. Zacapa, alt. 122 meters, January 1, 1906, *Kellerman* 5618.

The name of *coananepilli* is given to this species in some parts of central and southern Mexico. It is reputed to have medicinal properties.

**4a. Boerhaavia viscosa apiculata** Standley, Contr. Nat. Herb. **12:** 383. 1909.

The type of this has not been reexamined and no additional material has been seen. Perhaps it must be considered a synonym of the species, although it seems different in having obtuse and mucronate leaf blades. The type was collected at Cofradia near Culiacan, Sinaloa, by Mr. T. S. Brandegee, October 20, 1904.

**5. Boerhaavia sonorae** Rose, Contr. Nat. Herb. **1:** 110. 1891.

Type locality, "Along watercourses near Alamos," Sonora. Type collected by Dr. Edward Palmer in 1890 (no. 715).

*Specimens examined:*

SONORA: Type; Hermosillo, June 10, 1897, *Maltby* 221, 259; vicinity of Navojoa, March 21, 1910, *Rose, Standley & Russell* 13137; rocky island in harbor, Guaymas, April 23, 1910, *Rose, Standley & Russell* 15018; Guaymas, June, 1897, *Rose* 1243.
BAJA CALIFORNIA: Los Angeles Bay, 1887, *Palmer* 172 and 172½; Todos Santos, January 2, 1890, *Brandegee* 486; San José del Cabo, March 6, 1897, *Anthony* 356.
SINALOA: Sandy soil along the river near Fuerte, March 25, 1910, *Rose, Standley & Russell* 13478; along the river near Rosario, April 15, 1910, *Rose, Standley & Russell* 14628; open field near Villa Union, April 2, 1910, *Rose, Standley & Russell* 13934.
TEPIC: Acaponeta, June 23, 1897, *Rose* 1432.

A specimen collected by Doctor Palmer at Torreon, Coahuila, in October, 1898, is very closely related to this species; it differs merely in having larger heads of flowers and fruit.

The species seems to be fairly common along the western coast of Mexico in Sonora and Sinaloa. It is frequent in open ground, especially in sandy soil, besides being abundant in waste places and in cultivated fields. The roots, at Fuerte, were said to be used medicinally. The common name was given here as *mochi*. It was stated that the town of Las Mochis farther down the river was given its name because of the abundance of the plant about its site. This statement was contradicted by others, however.

**6. Boerhaavia hirsuta** Willd. Phytog. **1:** 1. 1794.

*Boerhaavia polymorpha* L. C. Rich. Act. Soc. Hist. Nat. Paris **1:** 185. 1792.

*Boerhaavia caribaea* Jacq. Obs. Bot. **4:** 5. *pl. 84.* 1771.

*Boerhaavia diffusa hirsuta* Kuntze, Rev. Gen. Pl. 533. 1891.

Type locality not ascertained.

*Specimens examined:*

OAXACA: Tehuantepec, 1910, *Orcutt* 3014.

YUCATAN: 1895, *Gaumer* 309; Merida, November 30, 1864, *Schott* 3; Merida, February 12, 1865, *Schott* 21.

TABASCO: San Juan Bautista, 1888, *Rovirosa* 159.

GUATEMALA: Atucatempa, Depart. Jatiapa, alt. 920 meters, April, 1894, *Heyde & Lux* 6371; Gualán, January 19, 1905, *Deam* 393.

SALVADOR: *Renson* 319.

PANAMA: Ahorca Lagarto to Culebra, March 9, 1905, *Cowell* 369.

**7. Boerhaavia ixodes** Standley, sp. nov.

Perennial from a thick woody root; stems ascending, much branched, 40 cm. long or more, stout, densely glandular-hirsute below, glabrous above; leaf blades ovate or oblong, the lower obtuse, the upper acute, their margins somewhat undulate, thick, paler beneath, glandular-pubescent on both surfaces or almost glabrous, on petioles as long as the blades or shorter; flowers mostly sessile, few in each head, dark red; anthocarp ellipsoidal or clavate, strongly glandular.

Type in the U. S. National Herbarium, no. 573670, collected in the vicinity of Chihuahua, May 1 to 21, 1908, by Dr. Edward Palmer (no. 193).

In an earlier paper dealing with this family the writer confused this plant with *B. hirsuta*, and the specimens have usually been distributed under that name. Doctor Heimerl has designated it in the herbarium as a subspecies of *B. viscosa*, but it is amply distinct from both those species. Compared with the latter it has much more abundant and different pubescence on the lower part of the stem, and the branches of the inflorescence are glabrous rather than glandular. *Boerhaavia hirsuta* is altogether without glandular pubescence.

*Additional specimens examined:*

BAJA CALIFORNIA: Palm Valley, May 30, 1888, *Orcutt;* Santa Agueda, 1890, *Palmer* 225; Valle de las Palomas, May, 1883, *Orcutt;* Socorro Island, 1903, *Barkelew* 205.

DURANGO: Vicinity of Durango, 1896, *Palmer.*

SONORA: Sierra de Alamos, March 14, 1910, *Rose, Standley & Russell* 12819; about 5 miles below Minas Nuevas, March 12, 1910, *Rose, Standley & Russell* 12671; bed of the Rio de Sonora near Hermosillo, March 6, 1910, *Rose, Standley & Russell* 12454.

STATE UNKNOWN: Near San Pablo, April 20, 1847, *Gregg;* Cartajena, October, 1857, *Schott.*

In addition to these Mexican specimens the following from the southwestern United States have been examined:

ARIZONA: Congress Junction, alt. 920 meters, May 4, 1903, *Jones;* fenced area, Santa Rita Forest Reserve, May, 1903, *Griffiths* 4369; same locality, June, 1903, *Griffiths* 4782; Tucson, April 8, 1892, *J. W. Toumey* 473a; mesas, May 7, 1881, *Pringle.*

CALIFORNIA: San Jacinto Hot Springs, San Diego County, July 4, 1892, *Hasse* 5662; plains near the Middle Tule River, alt. 245 to 325 meters, 1897, *Purpus* 5009.

**8. Boerhaavia wrightii** A. Gray, Amer. Journ. Sci. II. **15:** 322. 1853.

*Boerhaavia bracteosa* S. Wats. Proc. Amer. Acad. **20:** 370. 1885.

Type locality, "Pebbly hills near El Paso," Texas. Type collected by Charles Wright (no. 618).

*Specimens examined:*

SONORA: Papago Tanks, Pinacate Mountains, November 16, 1907, *Mac Dougal* 43.

**9. Boerhaavia fallax** Standley, sp. nov.

A much branched annual with slender, erect or spreading branches; stems sparingly pilose below, glabrous above, but with glandular rings about the middle of the internodes; leaf blades lanceolate or linear-lanceolate, acute, glabrous, whitish beneath, and conspicuously brown-dotted, on petioles one-half or one-third as long; bracts small, linear-lanceolate, soon deciduous; flowers few, in slender, loose spikes, these in open panicles; perianth about 3 mm. long, with 1 exserted stamen; anthocarp about 2.5 mm. long and almost as thick, very obtuse above, constricted below, its 5 ribs acutish, smooth.

Type in the U. S. National Herbarium, no. 22930, collected at Los Angeles Bay, Baja California, in 1887, by Dr. Edward Palmer (no. 603).

The specimens were distributed as *Boerhaavia wrightii*, but they do not appear to be more closely related to that species than to some others. From that they differ in the smaller, less conspicuous, less brightly colored bracts, narrower leaves, much less pubescent stem, and the 5-ribbed fruit.

**10. Boerhaavia spicata** Choisy in DC. Prodr. **13**$^{2}$**:** 456. 1849.

*Boërhaavia palmeri* S. Wats. Proc. Amer. Acad. **24:** 69. 1889.

Type locality, Mexico.

*Specimens examined:*

CHIHUAHUA: Hacienda de San Miguel near Batopilas, 1885, *Palmer* 209.

SONORA: Dry sandy soil near Guaymas, 1887, *Palmer* 683; arroyo near Alamos, March 15, 1910, *Rose, Standley & Russell* 12899.

SINALOA: Open field near Villa Union, April 2, 1910, *Rose, Standley & Russell* 13935; sandy soil along the Rio Fuerte near Fuerte, March 25, 1910, *Rose, Standley & Russell* 13455; Culiacan, August 20, 1904, *Brandegee;* along the river near Rosario, in sandy soil, April 14, 1910, *Rose, Standley & Russell* 14587.

WITHOUT DEFINITE LOCALITY: Fragment of the type in the Gray Herbarium.

**11. Boerhaavia rosei** Standley, sp. nov.

A densely branched annual with spreading or ascending branches; stems slender, reddish, puberulent or covered in part with short gland-tipped hairs, above glabrous except for the glandular rings about the middle of the internodes; leaf blades ovate to lance-ovate, small, 10 to 20 mm. long, acute, thick, dull green above, paler beneath or glaucous, rounded or truncate at the base, glabrous; inflorescence much branched, the spikes slender with the flowers few and rather distant, never crowded; perianth less than 1 mm. long, pinkish, glabrous; stamens included; bractlets linear, attenuate, hyaline; anthocarp narrowly obpyramidal, 3 mm. long, truncate at the apex, brown at maturity, glabrous, with 5 narrow, straight, smooth ribs.

Type in the U. S. National Herbarium, no. 636279, collected in sandy soil along the Rio Fuerte near the town of Fuerte, Sinaloa, March 25, 1910, by Rose, Standley & Russell (no. 13156). The fruit of the plant strongly resembles that of *Boerhaavia erecta*. No other species of this group has truncate fruit, that of the others being rounded at the apex.

**12. Boerhaavia watsoni** Standley, Contr. Nat. Herb. **12:** 384. 1909.

*Boerhaavia spicata palmeri* S. Wats. Proc. Amer. Acad. **24:** 70. 1889.

Type locality, "Sandy mesas about Guaymas," Sonora. Type collected by Dr. Edward Palmer in 1887 (no. 141).

*Specimens examined:*

SONORA: Type; prairies, September, 1851, *Thurber* 792.

**13. Boerhaavia torreyana** (S. Wats.) Standley, Contr. Nat. Herb. **12:** 385. 1909.

*Boerhaavia spicata torreyana* S. Wats. Proc. Amer. Acad. **24:** 70. 1889.

Type locality, "Texas, New Mexico, and Arizona."

*Specimens examined:*

COAHUILA: Torreon, October, 1898, *Palmer* 488.

**14. Boerhaavia xanti** S. Wats. Proc. Amer. Acad. **24:** 69. 1889.

Type locality, "Cape Saint Lucas," Baja California. Type collected by L. J. Xantus in 1859–60 (no. 93).

*Specimens examined:*

BAJA CALIFORNIA: Type; same locality, *Xantus* 92; San José del Cabo, September 1, 1890, *Brandegee* 484; Binorama, 1899, *Brandegee.*

SONORA: Guaymas, 1887, *Palmer* 681.

Mr. Brandegee's no. 484 matches the type almost exactly. The specimens from Guaymas differ somewhat in having the leaves not black-dotted beneath and larger, less acute, and thinner, while the stems are more villous; they are without fruit.

**15. Boerhaavia alamosana** Rose, Contr. Nat. Herb. **1:** 110. 1891.

Type locality, "Hillsides about Alamos," Sonora. Type collected by Dr. Edward Palmer in September, 1890 (no. 714).

Only the type specimen has been examined.

The species is closely related to *B. coulteri* and more and better material is needed of both species to determine their exact status.

**16. Boerhaavia coulteri** (Hook.) S. Wats. Proc. Amer. Acad. **24:** 70. 1889.

*Senkenbergia coulteri* Hook. f. in Benth. & Hook. Gen. Pl. **3:** 6. 1880.

Type locality, Mexico.

*Specimens examined:*

SONORA: Rocky hillside near Hermosillo, March 7, 1910, *Rose, Standley & Russell* 12545; Mexican Boundary, *Schott.*

WITHOUT DEFINITE LOCALITY: *Doctor Coulter* 1425.

This last specimen probably is a duplicate type. The publication of the species is very unsatisfactory, the description being so short as to make the name almost a nomen nudum. Coulter's specimens probably came from northern Sonora and very possibly from the region about Hermosillo, as he is known to have collected there.

**17. Boerhaavia purpurascens** A. Gray, Amer. Journ. Sci. II. **15:** 321. 1853.

Type locality, "Stony hills near the copper mines of Santa Rita, New Mexico." Type collected by Charles Wright (no. 1725).

*Specimens examined:*

CHIHUAHUA: Near Chihuahua, 1887, *Palmer* 1582.

SONORA: Guadalupe Canyon, August 27, 1893, *Merton* 2044.

**18. Boerhaavia alata** S. Wats. Proc. Amer. Acad. **24:** 69. 1889.

Type locality, "On a small rocky island in Guaymas harbor," Sonora. Type collected by Dr. Edward Palmer in 1887 (no. 332, in part).

*Specimens examined:*

SONORA: Type; rocky island in the harbor, Guaymas, March 10, 1910, *Rose, Standley & Russell* 12616.

When the writer visited Guaymas in March and again in April none of the plants were seen growing, the season being still too dry. The dead plants of the previous season, however, were noticed everywhere. This species seemed to be the most abundant of all in this locality.

**19. Boerhaavia pterocarpa** S. Wats. Proc. Amer. Acad. **17:** 376. 1882.

Type locality, "Apache Pass, Arizona." Apache Pass is in the Chiricahua Mountains. The type was collected by J. G. Lemmon in 1881.

*Specimens examined:*

SONORA: Near Altar, 1904, *Griffiths* 6887.

**20. Boerhaavia triquetra** S. Wats. Proc. Amer. Acad. **24:** 69. 1889.

Type locality, "Sandy plains and stony ridges near Los Angeles Bay," Baja California. Type collected by Dr. Edward Palmer in 1887 (no. 521).

*Specimens examined:*

BAJA CALIFORNIA: Type; also Palmer's 603 collected in the same locality during the same season.

**21. Boerhaavia maculata** Standley, Contr. Nat. Herb. **12:** 379. 1909.

Type locality, "Guaymas, Sonora." Type collected by Dr. Edward Palmer in 1887 (no. 332, in part).

*Specimens examined:*

SONORA: Type.

SINALOA: Topolobampo, September, 1897, *Palmer* 208; dry rocky cliffs along the sea near Topolobampo, March 23, 1910, *Rose, Standley & Russell* 13324.

One of the most noticeable peculiarities of this species is the very long pedicels of some of the flowers, the longest becoming 10 mm. long or even more; the uppermost flowers of the corymb have shorter pedicels. The flowers, too, are very large for the genus; in the specimens collected by the writer at Topolobampo they were 6 or 7 mm. in diameter, of a delicate pink color. They were open late in the forenoon and were rather conspicuous upon the cliffs where plant life was not abundant. Only a few plants were observed and they probably were brought into flower so early because of the water dashed up from the sea upon the cliffs.

**22. Boerhaavia lateriflora** Standley, sp. nov.

An erect or spreading annual, much branched; stems slender, finely puberulent; leaf blades broadly lanceolate to oblong, glabrous, thin, of about the same color on both surfaces, acute to obtuse at the apex, rounded at the base, all on slender petioles one-third to half as long as the blade; inflorescence loosely paniculate, the earlier inflorescence consisting of peduncled, axillary umbels; flowers in many-flowered umbels, equally pedicellate; perianth white, 2 mm. long or more; stamens barely exserted; anthocarp clavate, 5-angled, 3 mm. long or less.

Type in the U. S. National Herbarium, no. 22945, collected at Guaymas, Sonora, in 1887, by Dr. Edward Palmer (no. 680). The station which has added so many species of Boerhaavia to our flora yields yet another. This one is nearest *B. intermedia* but differs in its thinner, usually more acute leaf blades which are not strongly glaucous beneath, and in its large white perianth. One of the most noticeable characteristics of the plant is the large number of long-peduncled umbels borne in the axils of the lower leaves, whence the specific name.

Other specimens were collected at Guaymas in 1887 by Doctor Palmer under numbers 678, 682, 684, 685, 686, and 687.

**23. Boerhaavia erecta** L. Sp. Pl. 3. 1753.

*Boerhaavia virgata* H. B. K. Nov. Gen. & Sp. **2:** 215. 1817.

*Valeriana latifolia* Mart. & Gal. Bull. Acad. Sci. Brux. **11**[1]**:** 124. 1844.

*Boerhaavia paniculata subacuta* Choisy in DC. Prodr. **13**[2]**:** 451. 1849.

Type locality, "In Vera Cruce," Mexico.

*Specimens examined:*

SONORA: Guaymas, 1887, *Palmer* 182.

SINALOA: Culiacan, 1891, *Palmer* 1505; old field east of Mazatlan, April 7, 1910, *Rose, Standley & Russell* 14160; sandhills near Rosario, April 15, 1910, *Rose, Standley & Russell* 14630; Rosario, July 24, 1897, *Rose;* Culiacan, 1904, *Brandegee;* Rosario, July, 1897, *Rose* 1827, 1844; between Rosario and Colomas, July 12, 1897, *Rose* 1605.

TEPIC: Arroyo south of Acaponeta, April 9, 1910, *Rose, Standley & Russell* 14251; Acaponeta, June 29, 1897, *Rose* 1498.

JALISCO: Barranca near Guadalajara, June, 1886, *Palmer* 121; Bolaños, September, 1897, *Rose* 3684.

DURANGO: Ramos to Inde, August, 1898, *Nelson* 4695; barren hills about Tlahualilo, alt. 1,000 meters, August 27, 1905, *Pittier* 487.

NUEVO LEON: Monterey, September 7, 1902, *Pringle* 11139.

OAXACA: Near San Gerónimo, alt. 65 meters, July, 1895, *Nelson* 2760; Cuicatlan, September 24, 1894, *L. C. Smith* 206.

PUEBLA: Santa Lucia, vicinity of San Luis Tultitlanapa, June, 1908, *Purpus* 3521.

GUERRERO: Balsas, September 9, 1910, *Hitchcock*.

MORELOS: Near Yautepec, July, 1905, *Rose, Painter & Rose* 8549.

TAMAULIPAS: Vicinity of Victoria, alt. 320 meters, 1907, *Palmer* 198; Tampico, July 21, 1910, *Hitchcock*.

COLIMA: Acapulco, 1894–5, *Palmer* 309; Colima, July, 1897, *Palmer* 28; Manzanillo, December, 1890, *Palmer* 907.

VERA CRUZ: Rio de Santa Maria, Zacuapan, August, 1906, *Purpus* 1929.

YUCATAN: Merida, June 12, 1865, *Schott* 478; 1896, *Valdez* 91; 1895, *Gaumer* 361.

SALVADOR: *Renson* 147; San Salvador, April, 1905, *Velasco* 8857.

NICARAGUA: 1853–6, *C. Wright;* Asseradores Island, Depart. Chinandega, January 19, 1903, *Baker* 2134.

GUATEMALA: Amatitlán, Depart. Amatitlán, alt. 1,200 meters, October, 1904, *Tuerckheim* 8741; waste places about Gualán, alt. 190 meters, June 20, 1909, *Deam* 6386; vicinity of Puerto Barrios, near sea level, June 2, 1903, *Pittier* 381; Moran, Depart. Amatitlán, February 8, 1905, *Kellerman* 4535; Cuajiniquilapa, Depart. Santa Rosa, alt. 800 meters, September, 1893, *Heyde & Lux* 6296; Chicacao, Depart. Sololá, alt. 460 meters, February, 1894, *Heyde & Lux* 6372; Escuintla, Depart. Escuintla, alt. 335 meters, March, 1890, *J. D. Smith* 2045.

COSTA RICA: In open field, Nicoya, alt. 200 meters, May 22, 1903, *Cook & Doyle* 650; plaines de Zent, finca Chirripó, dans les cultures, alt. 200 meters, February, 1900, *Pittier* 16044; Zent banana plantation, Port Limon, at sea level, May 2, 1903, *Cook & Doyle* 450; cultures á Nicoya, January, 1900, *Pittier* 13813.

HONDURAS: San Pedro Sula, 1887, *Thieme* 5425b.

The subspecies *thornberi* (M. E. Jones) Standley, is represented in Mexico by some of the specimens listed. From the typical form it differs merely in not having the leaves black-dotted beneath and in its somewhat stricter habit.

**24. Boerhaavia universitatis** Standley, Contr. Nat. Herb. **12:** 380. 1909.

Type locality, "On the campus of the university, Tucson, Arizona." Type collected by Prof. J. J. Thornber, in 1903.

*Specimens examined:*

BAJA CALIFORNIA: Carmen Island, November, 1890, *Palmer* 845; San José del Cabo, October 24, 1902, *Brandegee;* same locality, November, 1902, *Brandegee;* same locality, September 3, 1890, *Brandegee* 485.

COAHUILA: Monclova, 1880, *Palmer* 1123.

CHIHUAHUA: Southwestern Chihuahua, 1885, *Palmer* 225.

SONORA: Agiabampo, 1890, *Palmer* 758; Guaymas, 1887, *Palmer* 679.

**25. Boerhaavia intermedia** M. E. Jones, Contr. Western Bot. **10:** 41. 1902.

Type locality: "El Paso, Texas."

*Specimens examined:*

CHIHUAHUA: *Thurber* 732; hills near Chihuahua, 1886, *Pringle;* between Casas Grandes and Sabinal, September, 1899, *Nelson* 6378.

SONORA: August, 1851, *Thurber* 1050.

COAHUILA: Torreon, October, 1898, *Palmer* 468.

## 20. CYPHOMERIS Standley, nom. nov.

*Lindenia* Mart. & Gal. Bull. Acad. Sci. Brux. **10**[1]: 357. 1843, not Benth. 1842.
*Tinantia* Mart. & Gal. op. cit. **11**[1]: 240. 1844, not Schiedw. 1839.
*Senkenbergia* Schauer, Linnaea **19:** 711. 1847, not *Senckenbergia* Gaert. Mey. & Scherb. 1800.

Type species, *Lindenia gypsophiloides* Mart. & Gal.

KEY TO THE SPECIES.

Stems and leaves glabrous; leaf blades ovate-lanceolate or linear-lanceolate, usually entire; inflorescence of usually simple racemes..... 1. *C. gypsophiloides.*
Stems and leaves puberulent; leaf blades ovate, the margins undulate; inflorescence much branched..... 2. *C. crassifolia.*

**1. Cyphomeris gypsophiloides** (Mart. & Gal.) Standley.

*Lindenia gypsophiloides* Mart. & Gal. Bull. Acad. Sci. Brux. **10**[1]: 358. 1843.
*Tinantia gypsophiloides* Mart. & Gal. op. cit. **11**[1]: 240. 1844.
*Senkenbergia annulata* Schauer, Linnaea **19:** 711. 1847.
*Boerhaavia gibbosa* Pavon; Choisy in DC. Prodr. **13**[2]: 457. 1849.
*Senkenbergia gypsophiloides* Benth. & Hook. Gen. Pl. **3:** 6. 1880.
*Boerhaavia gypsophiloides* Coulter, Contr. Nat. Herb. **2:** 354. 1894.

Type locality, "Dans les plaines à mimosées et à cactées de Tehuacan de las Granadas, à environ 5,000 pieds."

*Specimens examined:*

CHIHUAHUA: Near Chihuahua, 1885, *Pringle* 693; Chihuahua, 1886, *Pringle* 937.
COAHUILA: Saltillo, 1898, *Palmer* 1714.
PUEBLA: Tehuacán, 1905, *Purpus* 1331.
HIDALGO: Ixmiquilpan, 1905, *Purpus* 1438; on Sierra de la Mesa, 1905, *Rose, Painter & Rose* 9133.
NUEVO LEÓN: Between Monterey and Cerralvo, 1847, *Wislizenus* 340.
WITHOUT DEFINITE LOCALITY: *Doctor Coulter* 1434; *Gregg* 513.

**2. Cyphomeris crassifolia** Standley.

*Senkenbergia crassifolia* Standley, Contr. Nat. Herb. **12:** 373. 1909.

Type locality, "Saltillo, Coahuila." Type collected in 1898 by Dr. Edward Palmer (no. 172).

*Specimens examined:*

NUEVO LEÓN: Monterey, *Edwards;* Nuevo León, October 12, 1895, *Caec. & Ed. Seler* 1111.
COAHUILA: Azufrora, 1848–9, *Gregg* 513.
WITHOUT DEFINITE LOCALITY: Between San Luis Potosí and San Antonio, Texas, August, 1878, *Parry & Palmer* 771 (in part).

## 21. COMMICARPUS Standley.

*Commicarpus* Standley, Contr. Nat. Herb. **12:** 373. 1909.

Type species, *Boerhaavia scandens* L.

KEY TO THE SPECIES.

Pedicels glabrous; glands scattered irregularly over the fruit..... 1. *C. scandens.*
Pedicels pubescent; glands arranged in more or less regular horizontal rows about the fruit..... 2. *C. brandegei.*

**1. Commicarpus scandens** (L.) Standley, Contr. Nat. Herb. **12:** 373. 1909.

*Boerhaavia scandens* L. Sp. Pl. 3. 1753.
*Boerhaavia sarmentosa* P. Br. Nat. Hist. Jam. 123. 1756.
*Boerhaavia grahami* A. Gray, Amer. Journ. Sci. II. **15:** 323. 1853.

Type locality, "In Jamaica ad urbem jago de la vega."

*Specimens examined:*

CHIHUAHUA: Vicinity of Aldama, May, 1908, *Palmer* 241.

SONORA: Santa Cruz Valley, 1852, *Thurber* 694; Guaymas, October, 1897, *Maltby* 192; Guaymas, 1887, *Palmer* 146; Hermosillo, 1892, *Brandegee;* rocky hills of the Sonoita, 1851–52, *Wright* 1715; rocky hill near Hermosillo, March 4, 1910, *Rose, Standley & Russell* 12344; along an irrigating ditch, Hermosillo, March 8, 1910, *Rose, Standley & Russell* 12540; hedges, Alamos, March 14, 1910, *Rose, Standley & Russell* 12844; hedges, Navojoa, March 21, 1910, *Rose, Standley & Russell* 13146.

COAHUILA: Environs de Matamoras, 1839, *Berlandier* 3204.

SAN LUIS POTOSÍ: Region of San Luis Potosí, 1878, *Parry & Palmer* 772.

BAJA CALIFORNIA: Los Angeles Bay, 1887, *Palmer* 146; San José del Cabo, October 25, 1902, *Brandegee;* Santa Agueda, March, 1890, *Palmer* 262; San Gregorio, 1890, *Brandegee* 483.

SINALOA: Altata, 1904, *Brandegee;* Culiacan, 1904, *Brandegee;* Villa Union, 1895, *Lamb* 388; Mazatlan, March 30, 1910, *Rose, Standley & Russell* 13733; Fuerte, March 25, 1910, *Rose, Standley & Russell* 13491; thickets along the river, San Blas, March 24, 1910, *Rose, Standley & Russell* 13398; hedges, Villa Union, April 2, 1910, *Rose, Standley & Russell* 13912; along the river near Rosario, April 14, 1910, *Rose, Standley & Russell* 14602; Culiacan, April 21, 1910, *Rose, Standley & Russell* 14888.

TAMAULIPAS: Sierra de San Carlos de Tamaulipas, 1836, *Berlandier* 3205.

ZACATECAS: Near San Juan Capistrano, August 21, 1897, *Rose* 2456.

OAXACA: Oaxaca, April, 1901, *Conzatti & Gonzales* 1273; Cuicatlan, September 24, 1894, *L. C. Smith* 192; de Tlacolula á Santa Ana, June, 1906, *Conzatti* 1459; vicinity of Cuicatlan, October, 1894, *E. W. Nelson* 1609; Tequisistlan, January 8, 1896, *Caec. & Ed. Seler* 1685; Oaxaca Valley, 1894, *C. L. Smith* 859.

HIDALGO: Ixmiquilpan, 1905, *Purpus* 1437; near Ixmiquilpan, *Rose, Painter & Rose* 8939.

PUEBLA: Near Tehuacán, 1905, *Rose, Painter & Rose* 9963.

QUERÉTARO: Near Querétaro, August, 1906, *Rose, Painter & Rose* 11174; between Higuerillas and San Pablo, August 24, 1905, *Rose, Painter & Rose* 9815 and *Altamirano* 1701.

MICHOACAN or GUERRERRO: Petatlan, alt. 50 meters, November 15, 1898, *E. Langlassé* 637.

YUCATAN: 1895, *Gaumer* 627.

COLIMA: Ymala, 1891, *Palmer* 1730.

It is possible that this may be an introduced plant on the west coast of Mexico as well as elsewhere. I have seen it only in the immediate vicinity of towns where it is almost invariably found in the hedges that line streets and roads. The fruit is exceedingly viscid, adhering to everything with which it comes in contact, so that it might easily be carried about by animals brushing against the plants or otherwise. The viscidity is retained by the fruits for a very long time in herbarium specimens.

**2. Commicarpus brandegei** Standley, Contr. Nat. Herb. **12:** 374. 1909.

*Boerhaavia elongata* Brandegee, Proc. Cal. Acad. II. **2:** 199. 1889, not Salisb. Prodr. Stirp. 56. 1796.

Type locality, "San Pablo, Jesús María," Baja California.

*Specimens examined:*

BAJA CALIFORNIA: San Pablo, 1889, *Brandegee*, type; Jesús María, 1889, *Brandegee;* Arroyo Salado, 1901, *Purpus* 243.

**2a. Commicarpus brandegei glabrior** Standley, Contr. Nat. Herb. **12:** 374. 1909.

Type locality, "San José del Cabo, Baja California." Type collected by T. S. Brandegee, September 29, 1893.

*Specimens examined:*

BAJA CALIFORNIA: Cape San Lucas, 1911, *Rose* 346.

## 22. **ANULOCAULIS** Standley.

*Anulocaulis* Standley, Contr. Nat. Herb. **12:** 374. 1909.
Type species, *Boerhaavia eriosolena* A. Gray.

1. **Anulocaulis eriosolenus** (A. Gray) Standley, Contr. Nat. Herb. **12:** 375. 1909.
*Boerhaavia eriosolena* A. Gray, Amer. Journ. Sci. II. **15:** 322. 1853.
Type locality, "Valley near Azufrora, in Coahuila or Durango, Northern Mexico." Type collected by Doctor Gregg in 1848 (no. 512).

*Specimens examined:*

COAHUILA: Azufrora, type; Viesca, 1905, *Purpus* 1053; Torreon, 1903, *Purpus;* San Lorenzo de Laguna, 70 miles southwest of Parrás, May, 1880, *Palmer* 1124.

*Anulocaulis leiosolenus* (Torr.) Standley should be found on the Mexican side of the Rio Grande, since it was first collected in the canyon of that stream 70 miles below El Paso.

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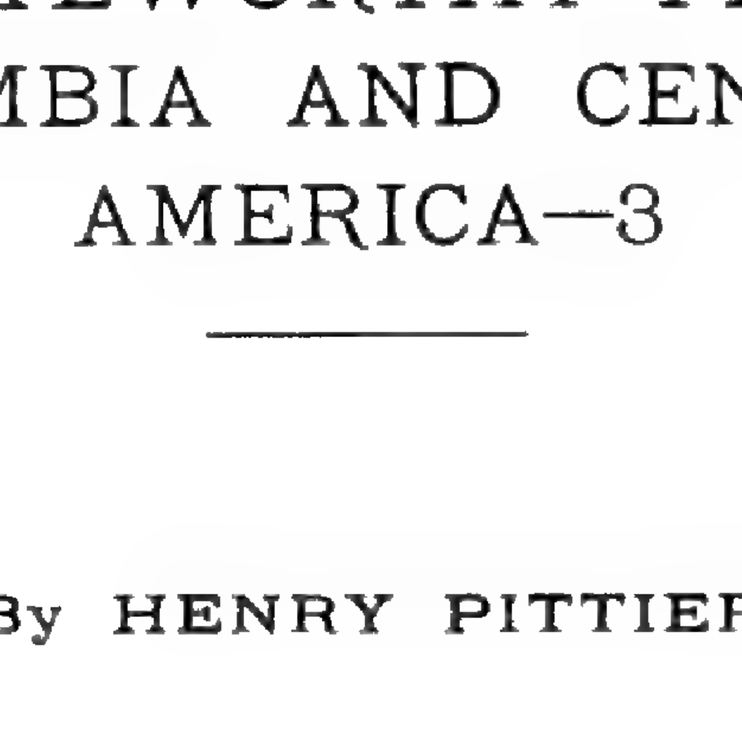
FROM THE

# UNITED STATES NATIONAL HERBARIUM

VOLUME 13, PART 12

# NEW OR NOTEWORTHY PLANTS FROM COLOMBIA AND CENTRAL AMERICA—3

By HENRY PITTIER




WASHINGTON
GOVERNMENT PRINTING OFFICE
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# PREFACE.

The present paper is the third of Mr. Pittier's series under the title "New or Noteworthy Plants from Colombia and Central America." An imperfectly known group of the mulberry family is revised, with the addition of three new species, and new species are described and old ones discussed in several other families. A large part of the species are trees, some of them of economic value. The results offered are based on actual field work by Mr. Pittier.

FREDERICK V. COVILLE,
*Curator of the United States National Herbarium.*

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# NEW OR NOTEWORTHY PLANTS FROM COLOMBIA AND CENTRAL AMERICA.

By Henry Pittier.

## MORACEAE.

### THE AMERICAN GENERA OF ARTOCARPOIDEAE-OLMEDIAE.

Bibliographical researches connected with the identification of several species of this family led me to attempt the revision of the generic status of the Artocarpoideae-Olmediae, the result of which is the reinstatement of the discarded Naucleopsis and Noyera and the dropping of Maquira. A tentative generic key is also given, our present knowledge of Pseudolmedia, Olmedia, Perebea, Naucleopsis, and Noyera reviewed, and a few new species described.

#### KEY TO THE AMERICAN GENERA.

Male flowers without perianth; stamens more or less scattered on the surface of the receptacle.
- Female receptacle uniflorous; interfloral bractlets of male flowers spatulate..... Pseudolmedia (p. 432).
- Female receptacles multiflorous; interfloral bracts more or less lamelliform and broad at base..... Castilla.[a]

Male flowers with perianth and 4 stamens.
- Female receptacles uniflorous.
  - Ovary superior; anthers introrse..... Olmedia (p. 433).
  - Ovary inferior; anthers extrorse..... Olmediophaena.
- Female receptacles multiflorous.
  - Style thick, short, and briefly bilobate..... Perebea (p. 436).
  - Style slender, elongate, and divided into 2 long, slender stigmas.
    - Perianth of female flowers none; ovary inferior, deeply immersed in the receptacle..... Naucleopsis (p. 439).
    - Perianth of female flowers 4-phyllous; ovary inferior but not at all immersed in the receptacle..... Helicostylis.
    - Perianth of female flowers monophyllous, thick, smooth at tip; ovary inferior, half immersed in the receptacle..... Noyera (p. 441).

[a] See Contr. Nat. Herb. **13**: 247. 1910.

## PSEUDOLMEDIA.[a]

Three representatives of this genus are found in the eastern valleys of Peru, one on the Pacific slope of Guatemala, and a fifth in the mountains of Cuba, Jamaica, and Porto Rico. The type species is *Pseudolmedia havanensis* Trécul. Of this the author describes and illustrates the flowers, male and female, and a few details of the fruit will be found below. Three more species, all from Peru, are described in the same paper. Of one of these only the female flower is known, drawings of which are given, while of the two others, and also of the newly made *P. oxyphyllaria*, the male flowers only have been more or less thoroughly reported upon. A sixth species, *P. bucidaefolia* Bello,[b] is doubtful on account of the assumed two-flowered female receptacles and other characters that do not belong to the genus.

### KEY TO THE SPECIES.

Leaves glabrous or nearly so.
- Primary veins 10 to 12 (?); bracts of male flowers glabrescent.. 1. *P. havanensis.*
- Primary veins 15 or more.
  - Leaf blades 5 to 9 cm. long, 2 to 3 cm. broad; bracts of male flowers pubescent..... 2. *P. laevigata.*
  - Leaf blades 15 to 20 cm. long, 4 to 6 cm. broad; bracts of male flowers distinctly silky..... 3. *P. oxyphyllaria.*

Leaves more or less hairy beneath.
- Leaves oblong-lanceolate, 7 to 16 cm. long, 2 to 4.5 cm. broad, downy beneath on the midrib and primaries, ciliate on the margin; stipules silky-ferruginose..... 4. *P. ferruginea.*
- Leaves oblong-elliptic, 13 to 23 cm. long, 5 to 10 cm. broad; midrib and primaries sparsely hairy; stipules densely yellowish silky..... 5. *P. macrophylla.*

**1. Pseudolmedia havanensis** Trécul, Ann. Sci. Nat. III. **8:** 130. *pl. 5. f. 149–154.* 1847.

FIGURE 57.

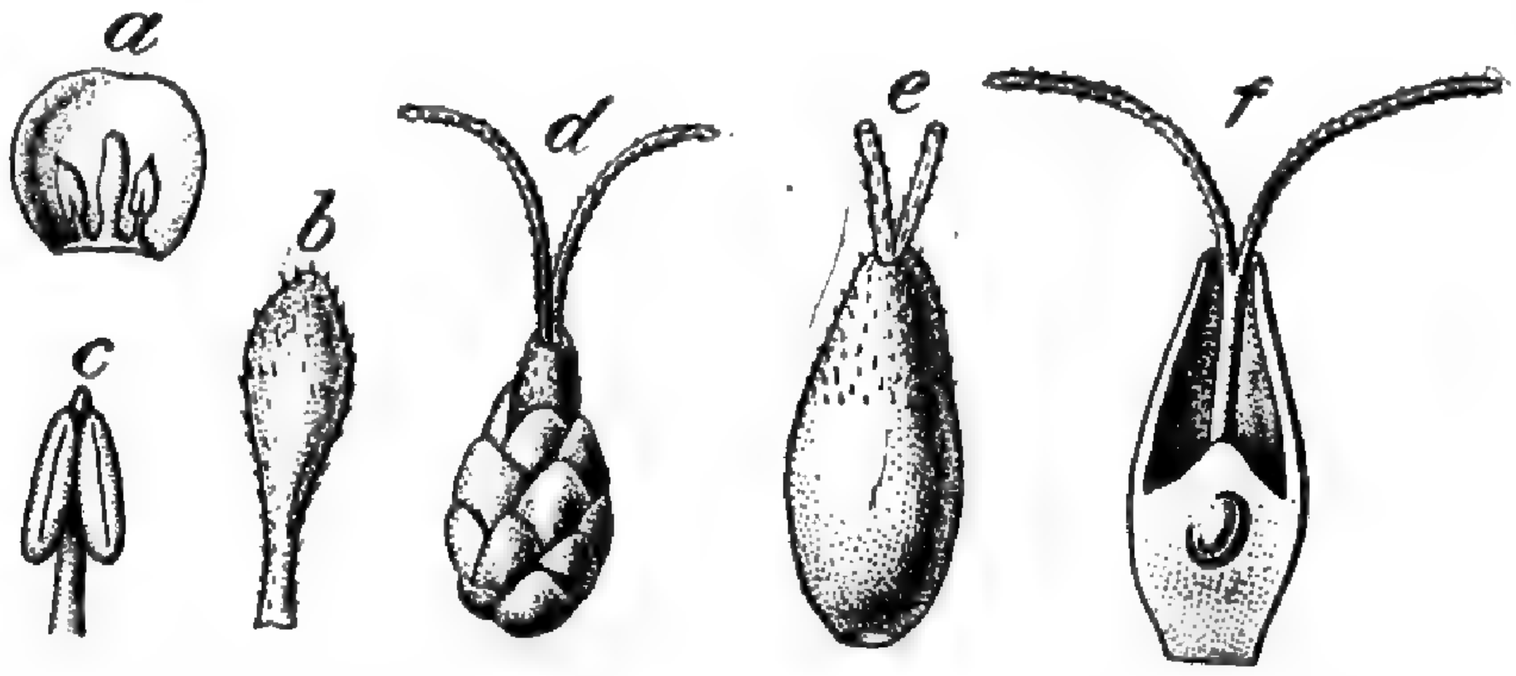



FIG. 57.—*Pseudolmedia havanensis*, floral details. *a*, Upper bract of involucre with three stamens inserted at the base, the middle one abortive; *b*, one of the spatulate bractlets intermingled with the anthers; *c*, stamen; *d*, female flower; *e*, the same without its squamose involucre; *f*, the same opened longitudinally to show insertion of the pendent ovule. Variously enlarged. From Trécul, Ann. Sci. Nat. III. **8**: *pl. 5.*

*Pseudolmedia spuria* Griseb. Fl. Brit. W. Ind. 152. 1864.

---

[a] Pseudolmedia Trécul, Ann. Sci. Nat. III. **8:** 130. *pl. 5. f. 149–154.* 1847.

[b] Anal. Soc. Esp. Hist. Nat. **12:** 109. 1883.

*Olmedia cubensis* Klotzsch, Linnaea **20**: 523. 1847.

CUBA: In forests, *Poeppig;* San Jose, *Wright* 2223.

JAMAICA: *Swartz, Alex. Prior;* Saint Anns, *Grisebach.*

PORTO RICO: Along Rio Blanco in Sierra de Naguabo, February 5, 1886, *Sintenis* 5382.

PANAMA: Lion Hill, *Hayes* 639.

The fruit of *P. havanensis* has never been described; it is like an egg-shaped berry, about 14 mm. long, carnose, yellowish or red (?), stipitate. The seed is ovoid-elongate, 7 mm. long, 4.5 mm. in diameter, and covered with a brownish integument, *Wright* 2223.

**2. Pseudolmedia laevigata** Trécul, Ann. Sci. Nat. III. **8**: 131. 1847.

PERU: Without locality, Herb. Webb.

**3. Pseudolmedia oxyphyllaria** Donnell Smith, Bot. Gaz. **20**: 294. 1895. FIGURE 58.

GUATEMALA: Volcan de Tecuamburro, Santa Rosa, alt. 2,000 meters, *Heyde & Lux*, male flowers, February, 1893, *Donnell Smith* 4429 (U. S. National Herbarium no. 481107).







FIG. 58.—*Pseudolmedia oxyphyllaria*, details of male flower. *a*, Outer bract; *b*, one of the middle bracts; *c*, group of stamens with one spatulate bractlet; *d*,*d'*, single stamens. Scale 3.

**4. Pseudolmedia ferruginea** Trécul, Ann. Sci. Nat. III. **8**: 131. *pl. 5. f. 155–157.* 1847. FIGURE 59.

*Olmedia ferruginea* Poepp. & Endl. Nov. Pl. Poepp. **2**: 31. 1838.

PERU: Primeval forests around Lake Ega, Amazon Basin, *Poeppig.*

**5. Pseudolmedia macrophylla** Trécul, Ann. Sci. Nat. III. **8**: 132. 1847.

PERU: Without locality, Herb. Webb.

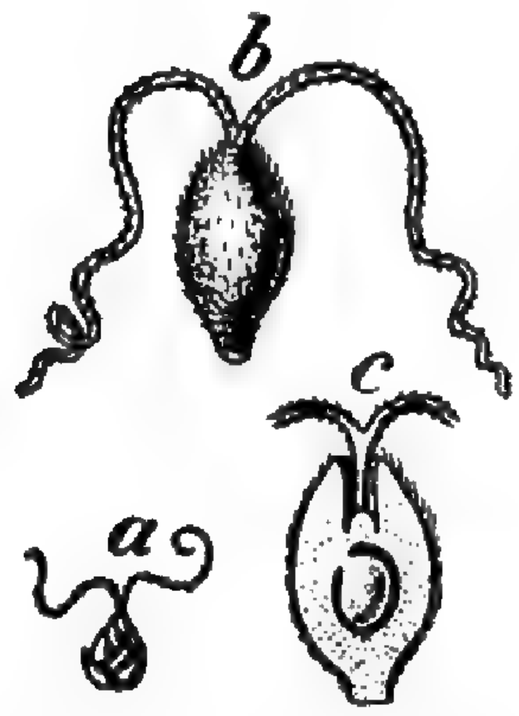



FIG. 59.—*Pseudolmedia ferruginea*, female flower. *a*, Female flower with involucre; *b*, the same without involucre; *c*, longitudinal section of the same. *a*, Natural size; *b*, *c*, considerably enlarged. From Trécul, Ann. Sci. Nat. III. **8**: *pl. 5.*

## OLMEDIA.[a]

The type of the genus is *Olmedia aspera* Ruiz & Pav., and the fundamental characters are, the female inflorescences bearing a single flower, surrounded by a bracteal involucre, and the tubulose or urceolate perianth surrounding the four stamens. Of the eight species known up to the present, one, *O. laurina*, is doubtful, its apparent affinities being with *Perebea calophylla* Benth. & Hook. (*Olmedia calophylla* Poepp.); two, *O. aspera* and *O. tovarensis*, have been poorly described on almost complete specimens; of *O. rigida* and *O. laevis*, only the female flowers have been superficially mentioned; while of the remaining species, *O. caucana*, *O. grandifolia*, and *O. falcifolia*, we know little besides the leaves and the male flowers. Under such conditions, any attempt at a natural grouping of the species according to their specific affinities is almost useless, and we must have recourse mainly to the leaf to establish an artificial key.

---

[a] Olmedia Ruiz & Pav. Syst. Veg. Peruv. Chil. 257. 1798.

KEY TO THE SPECIES.

Leaves entirely glabrous.
  Female flowers pedicellate..... 1. *O. laurina.*
  Female flowers sessile.
    Bracts of female flowers silky, with ciliate margin ..... 2. *O. rigida.*
    Bracts of female flowers hairy, with smooth margin..... 3. *O. laevis.*
Leaves more or less hairy.
  Male receptacles sessile..... 4. *O. aspera.*
  Male receptacles pedunculate.
    Leaves with entire margin..... 5. *O. tovarensis.*
    Leaves with more or less distinctly dentate or sinuate margin.
      Leaves distinctly sinuate-serrate; male perianth 2-lobulate..... 6. *O. caucana.*
      Leaves obscurely sinuate.
        Leaves obovate-oblong, large; stipules 20 to 30 mm. long; pedicels 5 to 10 mm. long..... 7. *O. grandifolia.*
        Leaves elliptic, middle-sized; stipules 6 to 7 mm. long; pedicels 3 mm. long ..... 8. *O. falcifolia.*

The area of the genus extends on both sides of the Andes from Peru to Costa Rica and eastward to the Guianas.

1. **Olmedia laurina** Baill. Adansonia **11:** 305. 1875. (An Perebea?.)
   COLOMBIA: *Triana.*

2. **Olmedia rigida** Klotzsch & Karst. Linnaea **20:** 524. 1847.
   VENEZUELA: In forests around Tovar, *Karsten.*

3. **Olmedia laevis** Ruiz & Pav. Peruv. Chil. Prodr. 129. *pl. 28.* 1794; Klotzsch & Karst. loc. cit. 524.
   PERU: *Ruiz.*
   ECUADOR: *Eggers* 15746.

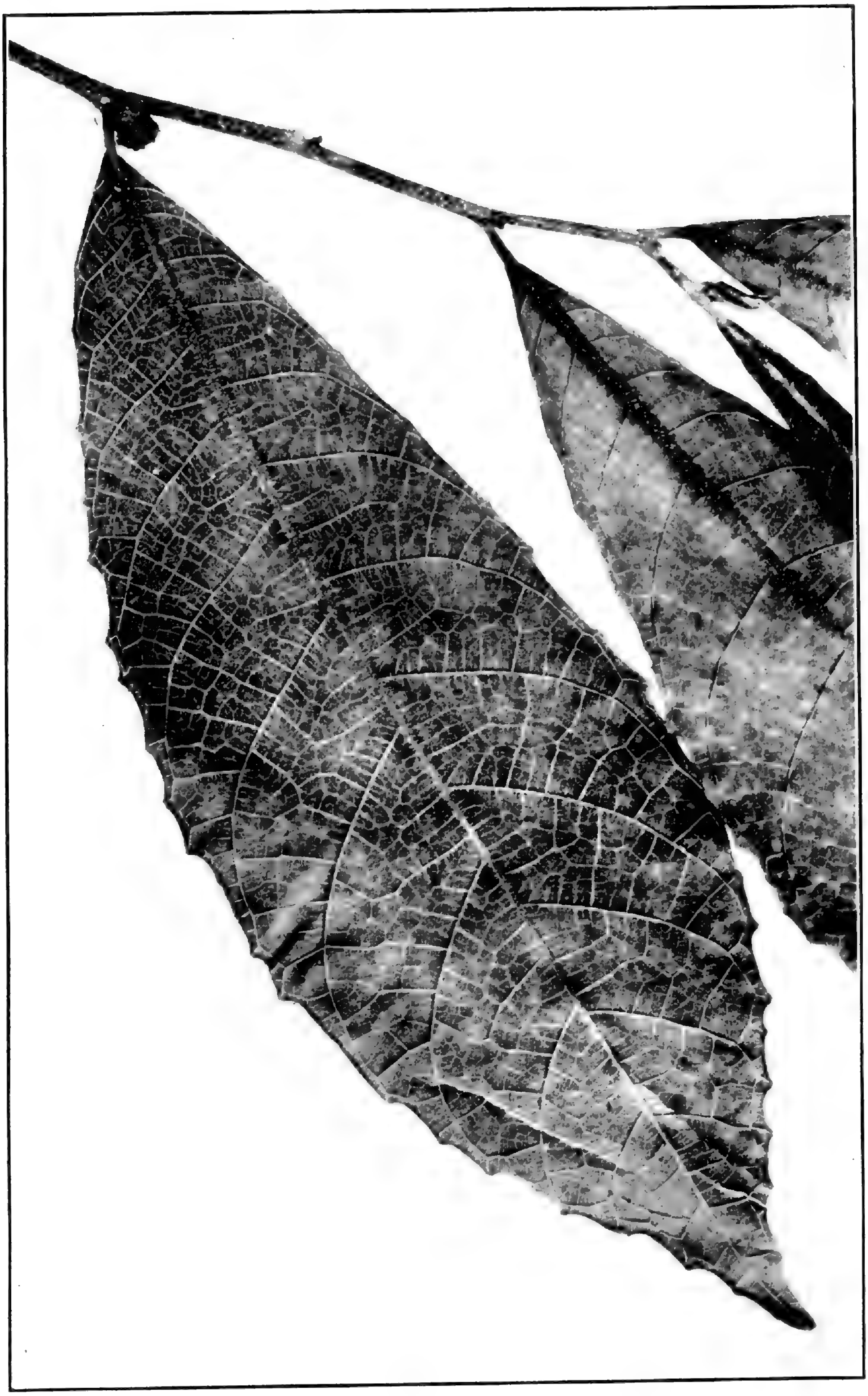
4. **Olmedia aspera** Ruiz & Pav. Syst. Peruv. Chil. 257; H. B. K. Nov. Gen. & Sp. **7:** 162. *pl. 633.* 1825. FIGURE 60.
   PERU: *Ruiz.*
   ECUADOR: *Ruiz.*

5. **Olmedia tovarensis** Klotzsch & Karst. loc. cit. 526.
   VENEZUELA: In the forests around the colony of Tovar, *Karsten.*
   COSTA RICA: Suerre, plains of Santa Clara, alt. 300 meters; male flowers only, April, 1896, *Donnell Smith* 6781. Identification doubtful.

6. **Olmedia caucana** Pittier, sp. nov. PLATES 78, 79. FIGURE 61.
   A small tree, 4 to 6 meters high, with erect-ascending limbs; bark of the branchlets brown, covered with a short, fugacious pubescence.
   Leaves distichous, rather large, provided each with a pair of caducous stipules; stipular scars joining at acute angle opposite the insertion of the petiole. Petioles hairy, rounded, thick, 8 to 10 mm. long. Leaf blades elliptic, cuneate at the base, abruptly narrowed into a long tip, inequilateral, the thinner half narrower and less rounded, 15 to 22 cm. long, 5 to 7 cm. broad, scabrous on both faces; main nerve and primary veins hairy and very prominent underneath; margin irregularly sinuate-serrate. Stipules lanceolate, broad at base, acuminate, purplish brown, 10 to 12 mm. long, scarious and minutely ciliate on the margin, slightly pubescent outside along the midrib.



OLMEDIA CAUCANA PITTIER.



OLMEDIA CAUCANA PITTIER.

Male inflorescences pedicellate, geminate in the axils of the leaves, but often solitary by abortion. Pedicels 8 to 10 mm. long, sparsely pubescent, provided at the base with two small scaly bracts. Receptacles flat, 8 to 10 mm. in diameter, covered outside with 2 or 3 concentric rows of bractlets, these ovate-lanceolate, more or less contracted at the base, usually acute at the tip, from 2 to 5 mm. long, 1.5 mm. broad or less, irregularly ciliate and covered outside with a few thick hairs. Flowers sessile, 20 to 25 on each receptacle. Perianth urceolate before anthesis, broadly short-tubular or campanulate after, monophyllous, thin, translucent, minutely pubescent outside, bilobulate; lobules broad, subulate, each with two dark, slender veins running from base to tip. Stamens 4, introrse before anthesis, glabrous; filaments nearly 4 mm. long, flattened and broad at the base, geniculate just below the anthers, these exserted, ovoid, about 1.8 mm. long. Pollen minute.

Female flowers, fruits, and seeds unknown.

Type in the U. S. National Herbarium, no. 530988, collected at La Manuelita near Palmira, Cauca Valley, Colombia, altitude about 1,200 meters, December 28, 1905, by H. Pittier (no. 803). Flowers.

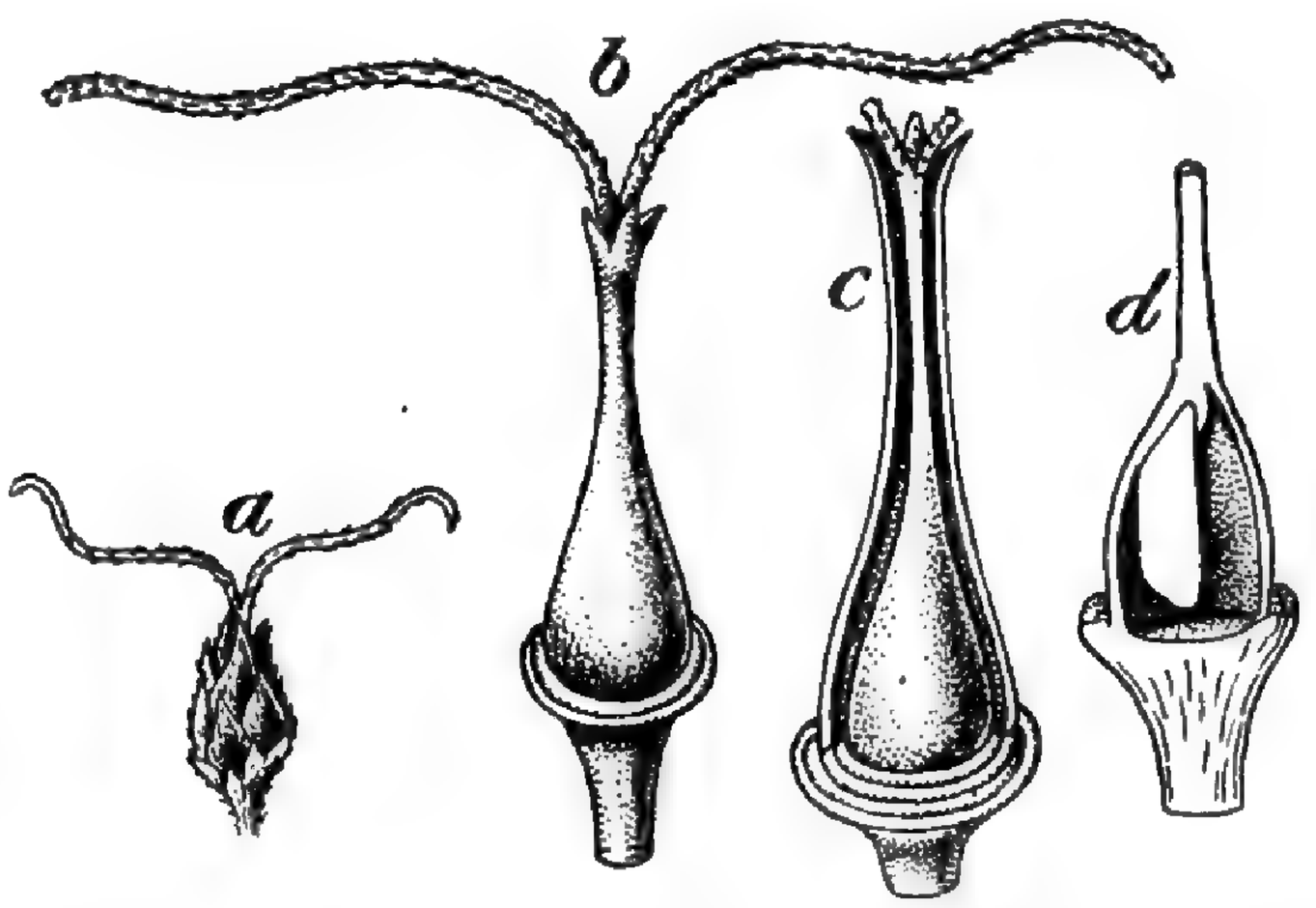



FIG. 60.—*Olmedia aspera*, female flower and fruit. *a*, Female flower; *b*, the same divested of its involucre; *c*, the same with the perianth open longitudinally; *d*, fruit, opened to show attachment of seed. *a*, Natural size; *b-d*. considerably enlarged. From Trécul, Ann. Sci. Nat. 8: *pl. 2*.

EXPLANATION OF PLATES 78, 79.—Twig with leaves and male inflorescence, plate 78 showing the upper and plate 79 the under surface of the leaves. From field photographs by H. Pittier.

**7. Olmedia grandifolia** Trécul, Ann. Sci. Nat. III. **8**: 128. 1847. FIGURE 62.

FRENCH GUIANA: Cayenne, *Martin* (in Herb. Mus. Paris).

**8. Olmedia falcifolia** Pittier, sp. nov. FIGURE 63.

A small tree; branchlets hirsute, rough, slender.

Leaves alternate, distichous; petioles thick, 4 to 6 mm. long, hairy; leaf blades elliptic, inequilateral, 10 to 24 cm. long, 2.5 to 7 cm. broad, acute at the base, narrowing at the end into a slender tip 3 to 4 cm. long, both faces glabrous or nearly so; main nerves and primary veins scarcely noticeable above, prominent and subscabrous underneath; margin entire or obscurely sinuate-dentate. Stipules 6 to 7 mm. long, lanceolate, broad at base, acute at tip, brownish, minutely hairy outside.

Male inflorescences 1 or 2-geminate in the axils of the leaves; pedicles about 3 mm. long, with two small scarious bracts at the base; receptacle flat about 6 mm. in diameter, covered outside with 2 to 4 concentric rows of bracteoles, these more or less scarious, broader, thicker, and shorter in the inner row, lanceolate-acuminate and delicate in the marginal row, all hairy pubescent outside and with irregular margins. Flowers sessile, 15 to 20 in each receptacle; perianth 1.5 to 2 mm. long, minutely

pubescent outside, urceolate or globose before anthesis, opening into 4 stipitate lobes. Stamens 4, introrse in the closed perianth, exserted later; filaments about 1.5 mm. long, broad and flattened at base, more or less twisted; anthers ovoid, about 1.2 mm. long. Pollen minute (about 0.012 mm. in diameter) with 3 (or 4) pores.

Type in the U. S. National Herbarium, no. 577150, collected along the river Hacum, near Terraba, Diquís Valley, altitude about 150 meters, February, 1892, by A. Tonduz. Male flowers only.

COSTA RICA: Type collection; woods of Currés near Boruca, Diquís Valley, at about 50 meters altitude, *Pittier*, male flower only, March 4, 1898 (Instituto fís. geog. Costa Rica, no. 12101; U. S. National Herbarium, no. 615381).

Species characterized by the long, curved acumen of its leaves, which are also mostly bent sidewise (i. e., in dried specimens, toward the twig to which they are attached.)




FIG. 61.—*Olmedia caucana*, details of male flower. *a*, Tip of floral bud before anthesis; *b*, open flower, early stage; *c* open flower after dehiscence of the anthers; *d*, *d'*, *d''*, various stages in the development of the anthers. Scale 3.

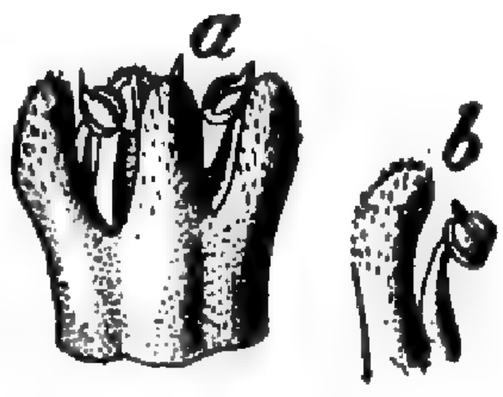



FIG. 62.—*Olmedia grandifolia*, male flower and stamen. *a*, Male flower; *b*, stamen inserted at base of one of the perianth segments. Both enlarged. From Trécul, Ann. Sci. Nat. III. 8: *pl. 2.*

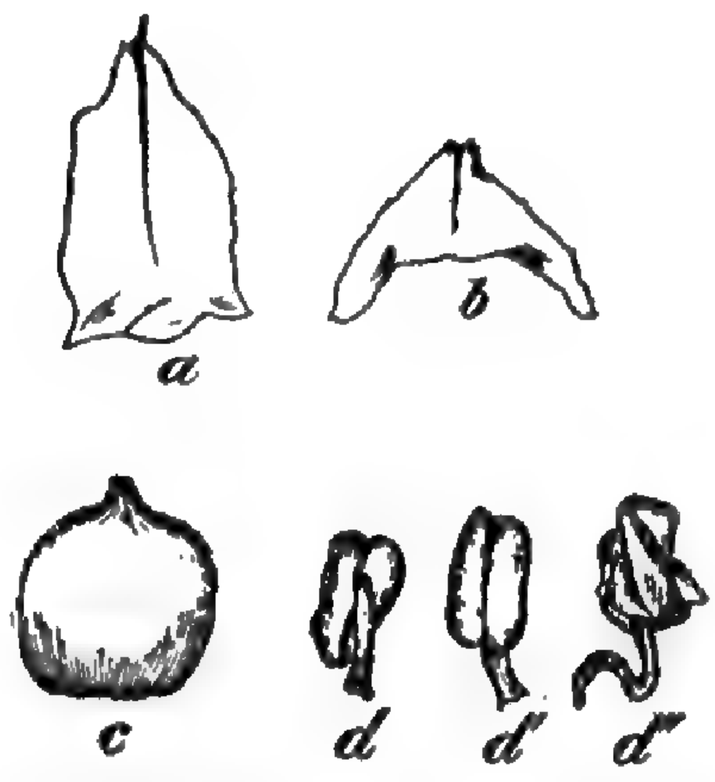



FIG. 63.—*Olmedia falcifolia*, details of male flower. *a*, Outer bract; *b*, inner bract; *c*, floral bud; *d*, *d'*, *d''*, stamens at different stages. Scale 6.

## PEREBEA.[a]

Our knowledge of this genus, the type of which is *Perebea guianensis* Aubl., is very defective. Its species are diœcious, according to Bentham and Hooker,[b] and this seems to be generally the case, although Karsten[c] expressly refers to his *P. xanthochyma* as a monœcious species.

In the male flowers the perianth is 4-parted, with thick, biseriate, imbricate divisions, this again agreeing with Bentham and Hooker's definition. But Engler says, "Blüthenhülle der männlichen Blüthen 4-teilig mit dicken Abschnitten in 2 Kreisen." It is not easy to understand how the segments of a monophyllous perianth can be placed alternately in two concentric circles. In *P. integrifolia* Karst., represented with *P. xanthochyma* in the above-cited plate 102, we see, however, that the perianth is divided almost to the base and that two of the divisions, apparently smaller, are exterior.

[a] Perebea Aubl. Pl. Guian. **2**: 953. 1775. [b] Gen. Pl. **3**: 373. 1880.
[c] Fl. Columb. **2**: 23. *pl. 102*. 1869.

In my *P. castilloides*, which also differs much from all the other species in the shape and size of its leaves, the segments of the male perianth are quite free and narrowly unguiculate. We are in the dark as to the characters of the male flowers in *P. guianensis*, *P. laurifolia*, and *P. markhamiana*, and it is doubtful whether *P. calophylla* has a monophyllous or polyphyllous perianth, although it is reported as "4-partitus."

In *Olmedia caucana*, described for the first time in the present paper, the leaves are strikingly like those of *Perebea markhamiana*, and the only reason, in the absence of female inflorescences or fruits, for placing the species in the first rather than in the second genus, is that the perianths are clearly gamophyllous, the base forming a narrow tube and the tips being divided into two (or perhaps later into four) lobules. A surprise may be in store for the botanist who shall first be enabled to investigate the female flowers of this species or the male flowers of *Perebea markhamiana*. Mr. O. F. Cook drew my attention to the fact that, while in the other known female flowers of Perebea the style simply branches into two short, pubescent lobules, there are broad, leaf-like stigmas, with an undulate margin, in the latter species. Should other characters in the male flowers or in the fruits show such wide departure from those attributed to Perebea, there could be no hesitation in concurring in Mr. Cook's suggestion to separate *P. markhamiana* as a distinct generic type.

As the situation now is, every species of the genus, but for one or two exceptions, is so imperfectly described that the leaf is nearly the only part on which an analytical synopsis can be sketched, unless, as is to be hoped, there are better materials in the European herbaria.

The genus seems to belong exclusively to the Hylaea formation, and its known representatives are in the Amazonian basin, in the Guianas, and on the eastern side of the Isthmus of Panama.

### KEY TO THE SPECIES.

Leaves and stipules very large, the first ones cordate; perianth 4-phyllous..... 1. *P. castilloides*.
Leaves more or less rounded or cuneate at base.
  Leaves subsessile, smooth, remotely dented; stipules rather large..... 2. *P. guianensis*.
  Leaves petiolate.
    Leaves entirely smooth.
      Style glabrous, branching into 2 thick, glabrous stigmas..... 3. *P. laurifolia*.
      Style hairy; stigmas rather long..... 4. *P. xanthochyma*.
Leaves smooth above, more or less hairy beneath.
  Leaves minutely pubescent beneath..... 5. *P. integrifolia*.
  Leaves stiff-hairy beneath, serrate..... 6. *P. markhamiana*.
  Leaves scabrous beneath, entire..... 7. *P. calophylla*.

**1. Perebea castilloides** Pittier, sp. nov. PLATES 80, 81. FIGURE 64.

A tree 10 to 15 meters high with the habit of Castilla. Latex yellowish. Young shoots with thick medulla, densely hairy outside.

Leaves alternate, each provided with two deciduous stipules. Petioles very thick, about 1 cm. long, densely hairy. Leaf blades very large, 39 to 45 cm. long, 14 to 16 cm. broad, oblong-lanceolate, deeply cordate, long-acuminate, subglabrous, except on the hairy midrib, and dark green above; paler and hairy on the midrib, veins, and venules beneath; midrib and primary veins very prominent underneath, the latter connected by regularly disposed transverse oblique and anastomosed venules; margin entire. Stipules large, 5 to 7 cm. long, 1 to 2 cm. broad at base, lanceolate, long-acuminate, hairy outside along the midrib, glabrous along the margin and inside, more or less deeply purple colored.

Male inflorescences in clusters of 4 in the axils of the leaves, each receptacle provided at the base with two dark-colored bracts, one of which is included in the other. Outer bract long triangular acuminate, hairy outside, smooth inside, 1.5 to 2 cm. long, about 0.8 cm. broad at the base, this enveloping the peduncle; inner bract covered outside with long, sparse hairs, 1 to 1.5 cm. long, 0.5 to 0.6 cm. broad at the base, abruptly contracted at about the middle into a rounded tip, included in that of the outer bract. Peduncles rather slender, hairy, 3 to 4 cm. long. Receptacles flat, 1.5 to 2 cm. in diameter, covered outside by several rows of hirsute, imbricate bracteoles, the basal ones ovate, obtuse, or acuminate, the marginal ones narrower and longer. Flowers numerous, sessile. Perianth polyphyllous, quite hairy, surrounded at the base with a crown of stiff hairs; segments 4, spatulate-calyptrate, 1 to 1.3 mm. long, very narrow at the base, opposite the divisions of the perianth and attached to them by the lower end, the two of the inner circle shorter than the exterior ones; filaments flattened and winged, sometimes subciliate at the edges; anthers semiexserted, small, heart-shaped.




FIG. 64.—*Perebea castilloides*, details of male flower. *a*, Flower from which one segment of the perianth and two anthers have been removed; *b*, two stamens inserted at base of perianth segments; *c*, a single stamen. Scale 9.

Female flowers, fruits, and seeds unknown.

Type in the U. S. National Herbarium, no. 615379, collected at Punta Peña near Chiriqui (Bocas del Toro), Panama, May, 1903, by H. Pittier. Male flowers only.

A remarkable species, worth investigating if the milk contains rubber as reported. It is doubtful whether it really belongs to Perebea; the leaves, very large and cordate, have a facies quite distinct from the one usual in this genus and remind of those of Castilla; the stipules are likewise large and striking; the male perianth is polyphyllous, its four divisions standing far apart and each bearing a stamen at the base; the shape of the anthers is also quite unusual. But for the lack of knowledge of the female flowers and fruits I should not hesitate to establish for this species a new genus.

EXPLANATION OF PLATES 80, 81.—Twigs with young and mature leaves and male inflorescences. From photographs taken by H. Pittier of fresh material from the tree furnishing the type specimen.

**2. Perebea guianensis** Aubl. Pl. Guian. **2**: 953. *pl. 361*. 1775.

FRENCH GUIANA: Along the Courou River, *Aublet*.

**3. Perebea laurifolia** Trécul, Ann. Sci. Nat. III. **8**: 133. *pl. 5. f.* 1847. FIGURE 65.

FRENCH GUIANA: Without locality, *Martin*.

**4. Perebea xanthochyma** Karst. Fl. Columb. **2**: 23. *pl. 112*. 1865.

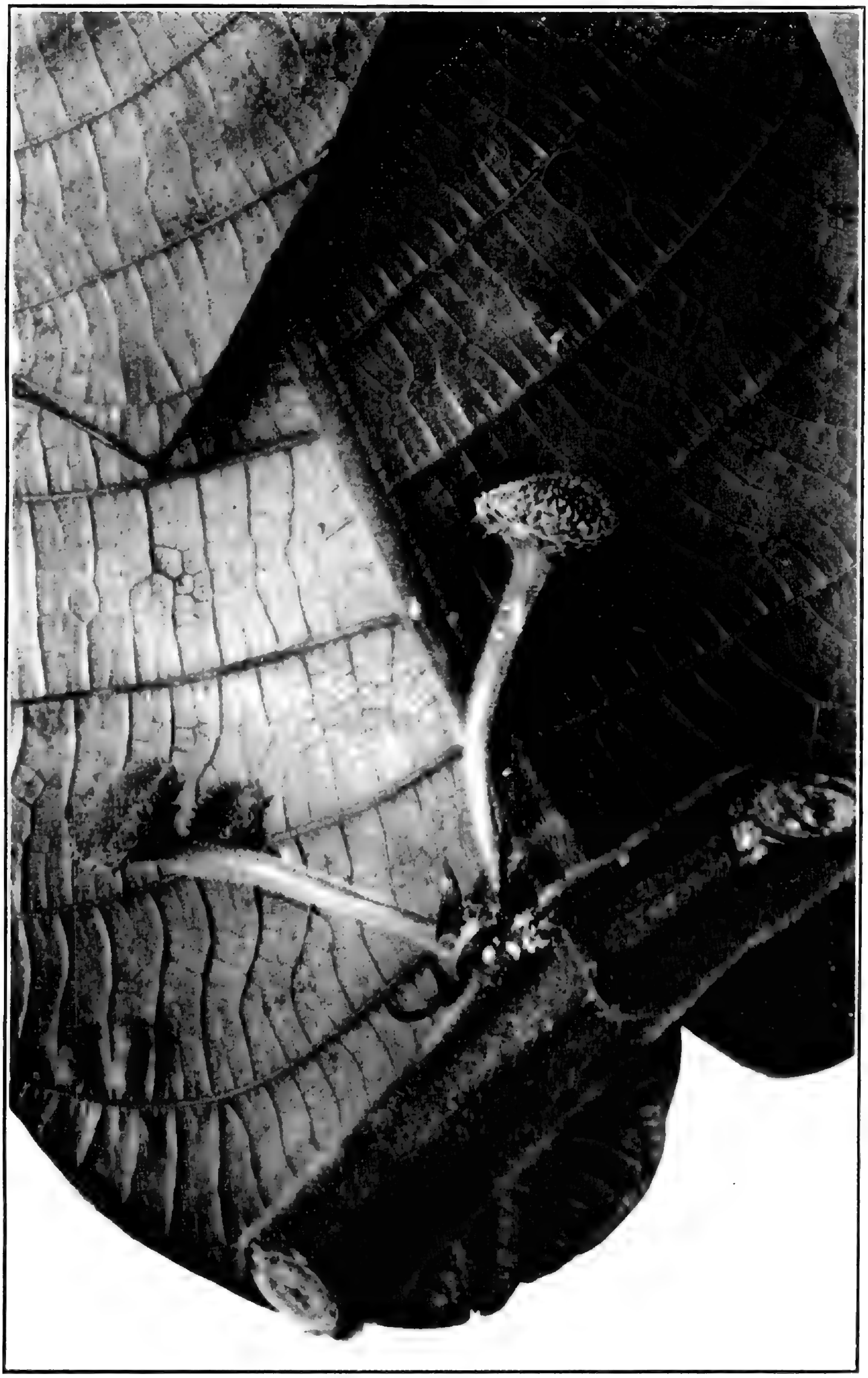
COLOMBIA: Wet forests along the Meta River, near Villavicencio (Karsten).

**5. Perebea integrifolia** Karst. Fl. Columb. **2**: 23. 1865.

COLOMBIA: With the foregoing.



PEREBEA CASTILLOIDES PITTIER.



PEREBEA CASTILLOIDES PITTIER.

**6. Perebea markhamiana** Benth.; Hook. f. Trans. Linn. Soc. Bot. II. **2**: 211. 1886.
*Castilloa markhamiana* J. Collins, Rep. Caoutch. Comm. 12. *pl. 3*. 1872.
PANAMA: In low woods at Lion Hill, *Hayes* 7.

**7. Perebea calophylla** Benth. & Hook. Gen. Pl. **3**: 371. 1883.
*Olmedia calophylla* Poepp. & Endl. Nov. Pl. Poepp. **2**: 32. *pl. 146*. 1838.
PERU: Virgin forests around Ega Lake, near Amazonas River, flowers October, *Poeppig*.

## NAUCLEOPSIS.[a]

But for the unusual hair-like stigmas that emerge gracefully from the tips of the so-called perianths of Miquel's Naucleopsis, the likeness of the drawings with my own specimens from Costa Rica would be almost perfect. These delicate organs do not, however, correspond satisfactorily with the enlarged illustrations of the same, nor with the description of *Naucleopsis glabra* Spruce, on which Bureau later founded his genus Ogcodeia. We are thus led to suspect that those styles of Naucleopsis, as shown in the plate referred to, under I (number omitted) and 31 (all three figures), are fictitious, as are also possibly the strongly marked teeth at the tip of the supposed perianths. Eliminating these details the original description of Miquel would be modified in the following manner:




FIG. 65.—*Perebea laurifolia*, details of female flower. *a*, Single flower; *b*, flower with perianth partly removed to show free upper part of ovary; *c*, longitudinal section showing the semi-inferior ovary and the insertion of the ovules. All enlarged. From Trécul, Ann. Sci. Nat. III. **8**: *pl. 5*.

Flores dioici. Masculi incogniti. *Feminei nudi, bracteolis sublignosis interpositis,* in receptaculo convexo deinde *ovoideo* basi pluriserialiter imbricato numerosis, extimi depauperati. Ovarium inferum, *in receptaculo utrinque immersum,* uniloculare, uniovulatum, ovulo prope apicem lateraliter pendulo anatropo. Stylus *elongatus inter bracteolis inclusus,* stigmatibus 2 elongatis. *Fructus receptaculo adnato; semen ovoideum.*

Thus conceived, in accordance with the details obtained from the examination of *N. glabra* and *N. naga,* Naucleopsis becomes a well-defined genus, intermediary perhaps between Perebea, Noyera, and Castilla, but with such distinctive characters as to preclude its amalgamation with any of them.

Engler seems to have treated the subject in a very desultory manner, his main purpose being apparently to reduce the number of genera. This is made evident by his careless handling of Miquel's illustrations of Naucleopsis, reproduced in the Pflanzenfamilien[b] as those of *Perebea*

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[a] Naucleopsis Miquel in Mart. Fl. Bras. **4**[1]: 120. *pl. 35*. 1853. *Ogcodeia* Bur. in DC. Prodr. **17**: 282. 1873.

[b] **3**[1]: 84. 1889.

*laurina*, thus affording a ready excuse for including Miquel's genus with the latter, a proceeding that is in no wise justified by the little we know of the Olmediae.

The discovery in Costa Rica of a representative of Naucleopsis is in itself highly interesting, as it shifts far toward the west and north the areal limits of the genus. *Naucleopsis macrophylla* and *N. glabra* both belong to the Amazonian basin. The discontinuous distribution indicated by the presence of a third species in Central America may be only apparent as, on account of the facility with which trees are overlooked by collectors, the same species, or perhaps others, may yet be found in the intervening region. Nor would it appear very extraordinary if it came to light even that Naucleopsis is in reality a monotypic genus, a suggestion that is not supported nor yet precluded by our present fragmentary information.

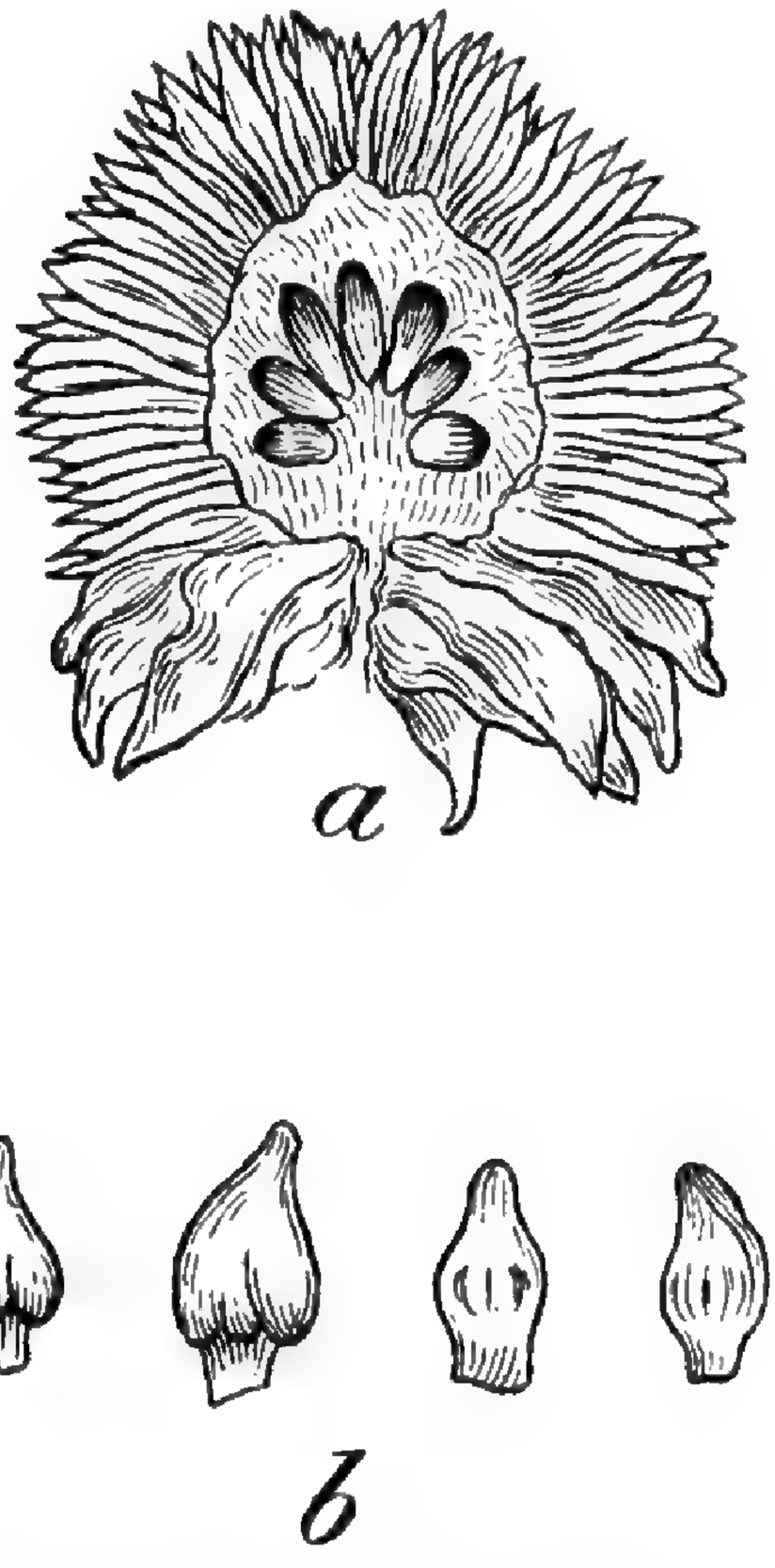



FIG. 66.—*Naucleopsis naga*, inflorescence. *a*, Vertical section; *b*, bracts at base. Natural size.

**1. Naucleopsis macrophylla** Miquel in Mart. Fl. Bras. **4**[1]: 120. *pl. 35*. 1853. PLATE 82.

BRASIL: Here and there in the Amazonian forests (*von Martius*).

Leaves more or less pubescent beneath.

EXPLANATION OF PLATE 82.—*a*, Twig with parts of leaves and a female inflorescence; *b*, view from side, and *c*, view from beneath of female inflorescence; *d*, longitudinal section of the same; *e*, two single flowers. Reproduction in part of Miquel's plate.

**2. Naucleopsis glabra** Spruce, ined. (Type of genus Ogcodeia Bureau.)

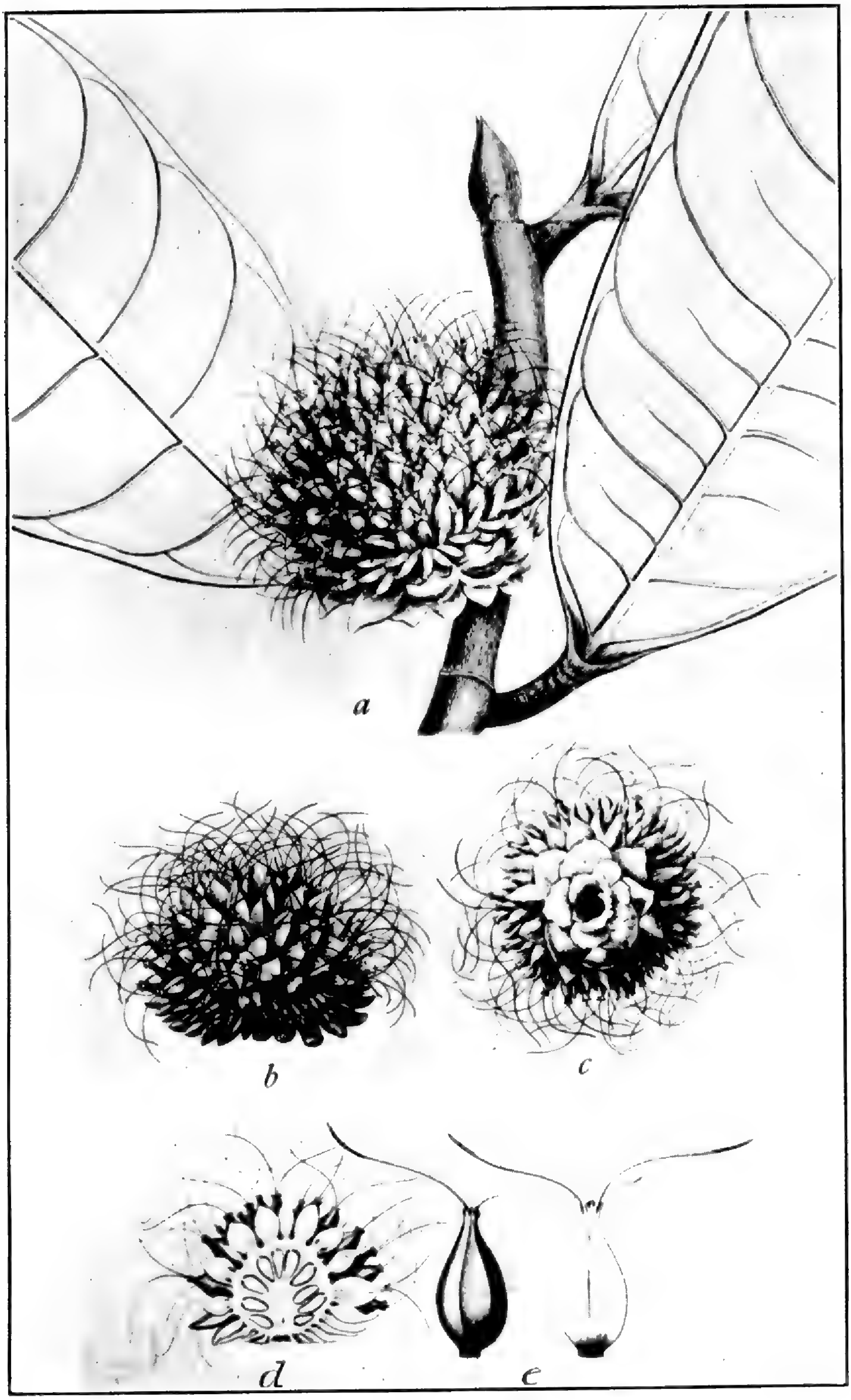
BRASIL: Near Panuré on the Uaupes River, *Spruce* 2793.

Leaves glabrous.

**3. Naucleopsis naga** Pittier, sp. nov. PLATES 83–85. FIGURES 66, 67.

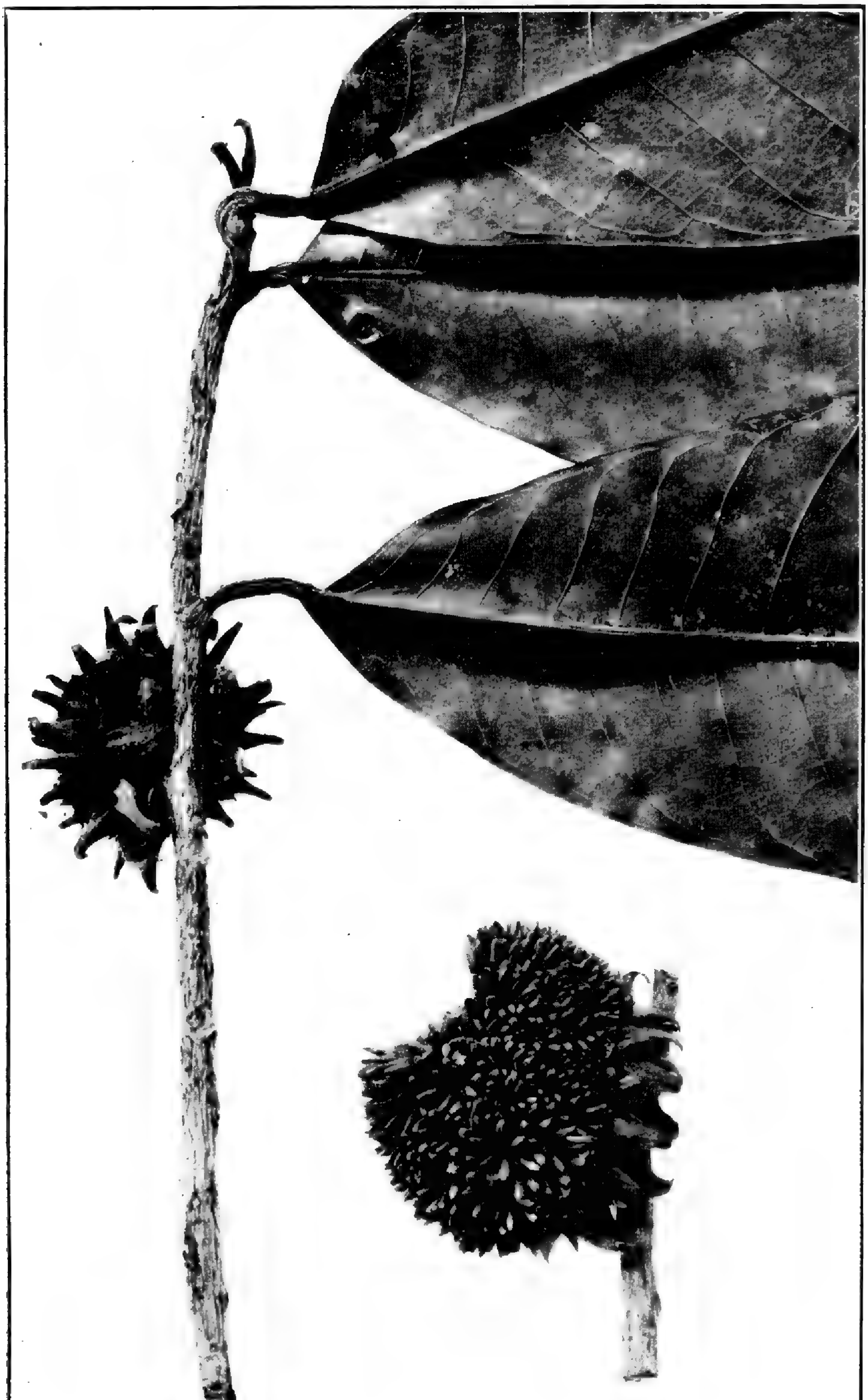
A tree 8 to 10 meters high. Branchlets subangulose, covered with a grayish, verruculose and striate bark. Leaf scars ovate, those of the stipules hardly apparent, with a high angle opposite the leaf. Internodes short and irregular.

Leaves large, distichous, more or less pendulous, massed at the ends of the twigs, entirely glabrous. Petiole of the mature leaf 2.3 cm. or less thick, obscurely canaliculate, longitudinally striate in dry specimens. Leaf blades 30 to 45 cm. long, 8 to 12 cm. broad, elliptic-lanceolate, cuneate-rounded at base, acuminate at tip; midvein and lateral veins obvious on both sides, but more conspicuous on the lower face, where the midvein is prominent, quite smooth and longitudinally striate; primary veins 22 to 24; margin entire. Stipules geminate, small (not over 15 mm. long), early deciduous, minutely pubescent on the back.

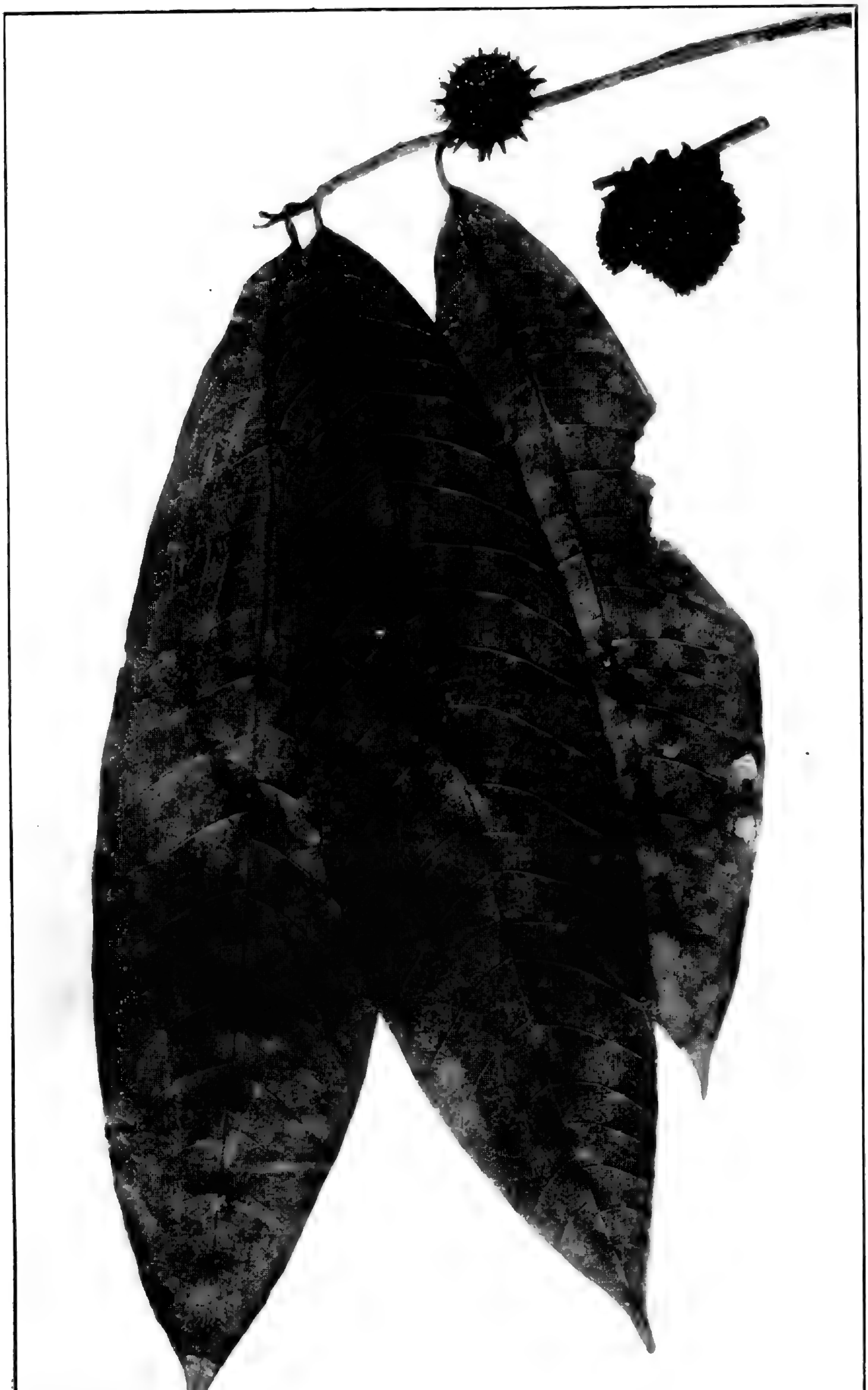



NAUCLEOPSIS MACROPHYLLA MIQ.

NAUCLEOPSIS NAGA PITTIER.



NAUCLEOPSIS NAGA PITTIER.



NAUCLEOPSIS NAGA PITTIER.

Female inflorescence sessile and solitary in the axils, altogether about 4 cm. in diameter. Receptacle at first convex, then ovoid, covered outside with 2 or 3 concentric rows of thick, ovate-lanceolate bracts, 8 to 15 mm. long, the basal ones broader (about 8 mm.), the marginal ones rather narrow (1 to 2 mm.), all brownish and squamulose; upper face of receptacle densely covered with erect, stiff bractlets, about 7 mm. long, claviform and attenuate at both ends, longitudinally plicate at the base, minutely hairy or squamulose (lepidote), enlarging later to 10 mm. or more long with an increased thickness. Flowers interspersed among the bractlets, 5 or 6 of the latter forming a kind of pseudoperianth around each style. Ovary deeply immersed in the receptacle, ovoid, the ovule hanging from the top of the cell; style 6 to 8 mm. long, the lower part (2 to 4 mm. long) filiform, glabrous, inclosed in the receptacle, the upper part, also glabrous, gradually thickening and then dividing into two diverging stigmas, 4 to 4.5 mm. long, thick, arcuate and with a verruculose, revolute stigmatic surface.

Fructiferous receptacle woody, shaped into an ovoid head; bracts and bractlets enlarged; styles persistent. Nutlets ovoid, about 4 mm. long, with a brown testa.

Type in the U. S. National Herbarium, no. 577712, collected in pastures at La Colombiana, plains of Santa Clara, Costa Rica, altitude about 100 meters, June, 1899, by H. Pittier. Female flowers and fruits only. Also in Instituto ffs. geog. Costa Rica, no. 13444.




FIG. 67. *Naucleopsis naga*, bractlets and style. *a*, *a′*, Interfloral bractlets (*a*, on fruiferous, *a′*, on fructiferous inflorescence); *b*, style. Scale 3.

Jimenez, plains of Santa Clara, alt. 200 meters, *J. J. Cooper*, leaves only; common name *naga* (Instituto fis.-geogr. no. 10221; U. S. National Herbarium no. 615391).

EXPLANATION OF PLATES 83–85.—Twigs with female inflorescenses and young fruits. From field photographs by H. Pittier. Natural size.

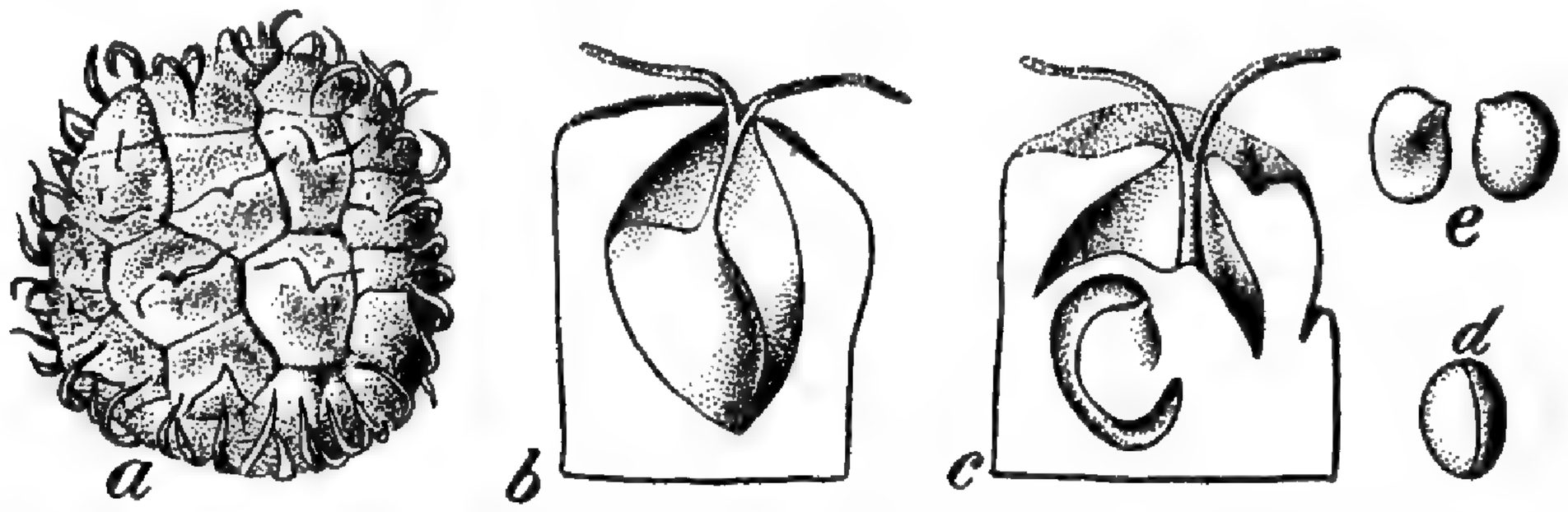



FIG. 68.—*Noyera rubra*, inflorescence and seed. *a*, Female inflorescence; *b*, female flower with the perianth partly cut off, showing the semi-inferior position of the ovary; *c*, vertical section of the same showing the anatropous, pendent ovule; *d*, seed; *e*, cotyledons separated, showing the short radicle. All enlarged. From Trécul, Ann. Sci. Nat. III. 8: *pl. 5*.

## NOYERA.[a]

This monotypic genus is founded on *N. rubra* Trécul, a tree from French Guiana, specimens of which, collected by Martin, are in the Paris Herbarium. To judge from the given illustrations (reproduced

[a] Ann. Sci. Nat. III. 8: 1. 1847.

here, fig. 68), the receptacle is flat, or at the most convex, and bordered by long, linear, subulate bracts. The ovules are half immersed in the former and the tubulose perianth is short, thick, smooth at tip, and opening by a small pore. The male inflorescence is unknown.

Bentham & Hooker[a] admit the genus Noyera, but amalgamate with it Naucleopsis and Ogcodeia, which differ not only by characters of the perianth, but also by the globose-ovoid receptacle in which the ovaries are deeply immersed. Engler[b] goes further, including Noyera, as conceived by Bentham and Hooker, in Perebea as a simple section. This does not appear to be justified, because in the latter genus the perianth is formed by four segments that are free or connate, disposed in two series, and always distinct at the tip. Besides, while the receptacle is more or less flattened, as in the typical Noyera, the ovaries are not immersed, the styles are short and thick, and the stigmatic branches are either short or, in one species (*P. markhamiana*), expanded, but never long-filiform. And, as we have just seen, Naucleopis stands still further from Perebea, on account of its ovaries inclosed in the body of the head-like receptacle.

## MAQUIRA, A GENUS WITHOUT A STATUS.[c]

This apparently monotypic genus was established by Aublet on immature specimens collected in French Guiana and described in his supplement to the Plantes de la Guiane entitled: "Plantes de la Guiane françoise dont on n'a pu se procurer des caracteres complets." No new material seems to have been collected, and it is quite surprising to find how, notwithstanding, the description of the genus has been steadily growing until it has reached its perfection in Baillon's Histoire des Plantes.[d]

While certain characters attributed by Aublet to the above-named Maquira agree with descriptions by subsequent authors of other species, belonging to distinct genera, it would occur to no one to deduce any near affinity between Maquira and Perebea from the comparison of plates 361 and 389 of the Plantes de la Guiane, already referred to. Besides, had such relationship existed, it is not likely that it would have escaped the notice of the careful French botanist and have failed to be mentioned by him. Trécul,[e] who made a thorough investigation of the group, does away with the genus Maquira and places its representative among his "species ignotae" attributing it with doubt to the genus Olmedia. The same view is taken by Miquel in his Urticineae of the Flora Brasiliensis.[f] But

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[a] Gen. Pl. **3**: 373.
[b] Pflanzenfam. **3**[1]: 84.
[c] Maquira Aubl. Pl. Guian. Suppl. 36. *pl. 389*. 1775.
[d] **6**: 206. 1877.
[e] Ann. Sci. Nat. III. **8**: 129. 1847.
[f] **4**[1]: 115. 1852.

26 years after the publication of Trécul's memoir, Bureau in De Candolle's Prodromus [a] reinstates Maquira in its former generic rank, giving it the following characteristics: "Stylus crassus. Stigma bilobum, lobis brevibus crassis. Ovarium inferum." The description of the style and stigma belongs to Perebea, in which, according to Trécul and his followers, the ovary is semi-inferior, while Aublet, the founder of the genus, leaves us in doubt as to this point.

Now, as Trécul does not seem to have seen any mature specimens of the typical *Perebea guianensis*, it is likely that he drew his conclusions as to the relative position of the ovary from an examination of his *Perebea laurifolia*, believed by Bureau to be precisely the same thing as *Maquira guianensis* and credited by him with an inferior ovary, while he gives this organ as superior in Perebea. And it is thus that by a little shifting of the ovary, up or down, from the middle position as given by Trécul, the reinstatement of the old and obscure Maquira becomes possible for the monographer of the Prodromus.

Baillon [b] not only follows Bureau, but completes the fragmentary descriptions hitherto given, so that, except for the unknown seeds, there is not any doubt left for the casual reader as to our almost perfect knowledge of the genus. In the footnotes giving the bibliography of Maquira,[c] however, we do not find any but the old sources mentioned above and there is no indication of Baillon having had opportunity to investigate new, mature, and complete specimens. We feel reluctant to call attention to such an informal proceeding on the part of Baillon, yet we can not but admit that his description is in the main a product of the imagination.

In the Pflanzenfamilien [d] Engler takes a new standpoint, assimilating with doubt Maquira to Helicostylis. We have thus three different views as to the real standing of that genus, badly founded originally upon imperfect specimens, and as none of the expressed opinions seems to be better justified than the others, it would seem more logical to drop altogether the cumbersome Maquira, or relegate it forever to the genera excludenda.

## ROSACEAE.

### THREE ECONOMIC TREES OF CENTRAL AMERICA.

**Licania platypus** (Hemsl.) Pittier.

*Moquilea platypus* Hemsl. Diagn. Pl. **1**: 9. 1878; Biol. Centr. Amer. Bot. **1**: 366. 1880; Hook. Icon. Pl. IV. **7**: *pl. 2618, 2619*. 1899. PLATE 86.

A large tree, reaching a height of 30 to 50 meters (Hemsley) when fully developed. Older branchlets rather thick, the glabrous, naked, dark purplish or brownish bark

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[a] **17**: 282. 1873.

[b] Hist. Pl. **6**: 154, 155, 206. 1877.

[c] Loc. cit. 206.

[d] **3**[1]: 84.

covered with white, rounded lenticels; younger shoots leaf-bearing, the bark deep brown or purple, densely dotted with minute, reddish white, prominent lenticels.

Leaves alternate and distichous, unusually long and narrow, perfectly glabrous. Petioles thick, 10 to 15 cm. long, shallow-canaliculate and of a dark color. Leaf blades coriaceous, elliptic-lanceolate to narrow-lanceolate, 10 to 25 cm. long, 3 to 6 cm. broad, acute at base and tip, more or less shiny above, glaucous beneath; main nerve thick, forming a broad, shallow groove above and rather prominent below; secondary nerves numerous (20 to 25), arcuate. Stipules geminate, short, broad at base and acuminate, irregularly ciliate.

Inflorescence broadly paniculate, terminal, regularly alternate-branched, very much condensed and provided with large, deciduous, purplish dark bracts and bractlets before blooming, broadly expanded, with rather slender branchlets during the anthesis. Panicles 10 to 35 cm. long, with pubescent branchlets and pedicels. Bracts (at base of main branchlets) narrowly lanceolate, 3.5 to 4 cm. long, 0.5 to 0.8 cm. broad, velvety-pubescent outside, smooth inside; bractlets (at base of flower clusters) also narrowly lanceolate, 0.5 to 1 cm. long, 0.2 to 0.5 cm. broad. Floral pedicels 1 to 2 mm. long. Receptacle canose-tomentose outside, provided inside on the staminal rim with a thick crown of brown woolly hairs. Sepals canose-tomentose, broadly ovate and acute, 1.8 to 2 mm. long, 1.6 to 1.8 mm. broad. Petals obovate, 2.5 to 3 mm. long, 1.5 to 1.8 mm. broad, narrow at base, acute at tip, ciliate, deciduous. Stamens 15 to 18; filaments subequal, glabrous. Ovary and lower half of style densely hairy.

Fruits very large, 1 to 3 to each panicle, 15 to 20 cm. long, 10 to 14 cm. in diameter, with a dark brown, verrucose skin, covered with white lenticels. Inside flesh yellow, juicy and sweet, somewhat fibrous. Seed usually single, ovate-oblong, flattened, 6 to 8 cm. long, 4 to 4.5 cm. in largest diameter; cotyledons large and fibrous, radicle small.

PANAMA: *Cuming* 1272 (Herb. Kew.).

COSTA RICA: Llanos de Currés, near Boruca, alt. 50 meters, *Pittier*, flowers, March 4, 1898 (Instituto fis.-geog. Costa Rica, no. 12102); Nicoya, *Cook, Collins & Doyle*, fruits, May 22, 1903, U. S. National Herbarium; *Pittier*, specimen of young fruit (Instituto fis.-geog. Costa Rica, no. 17131).

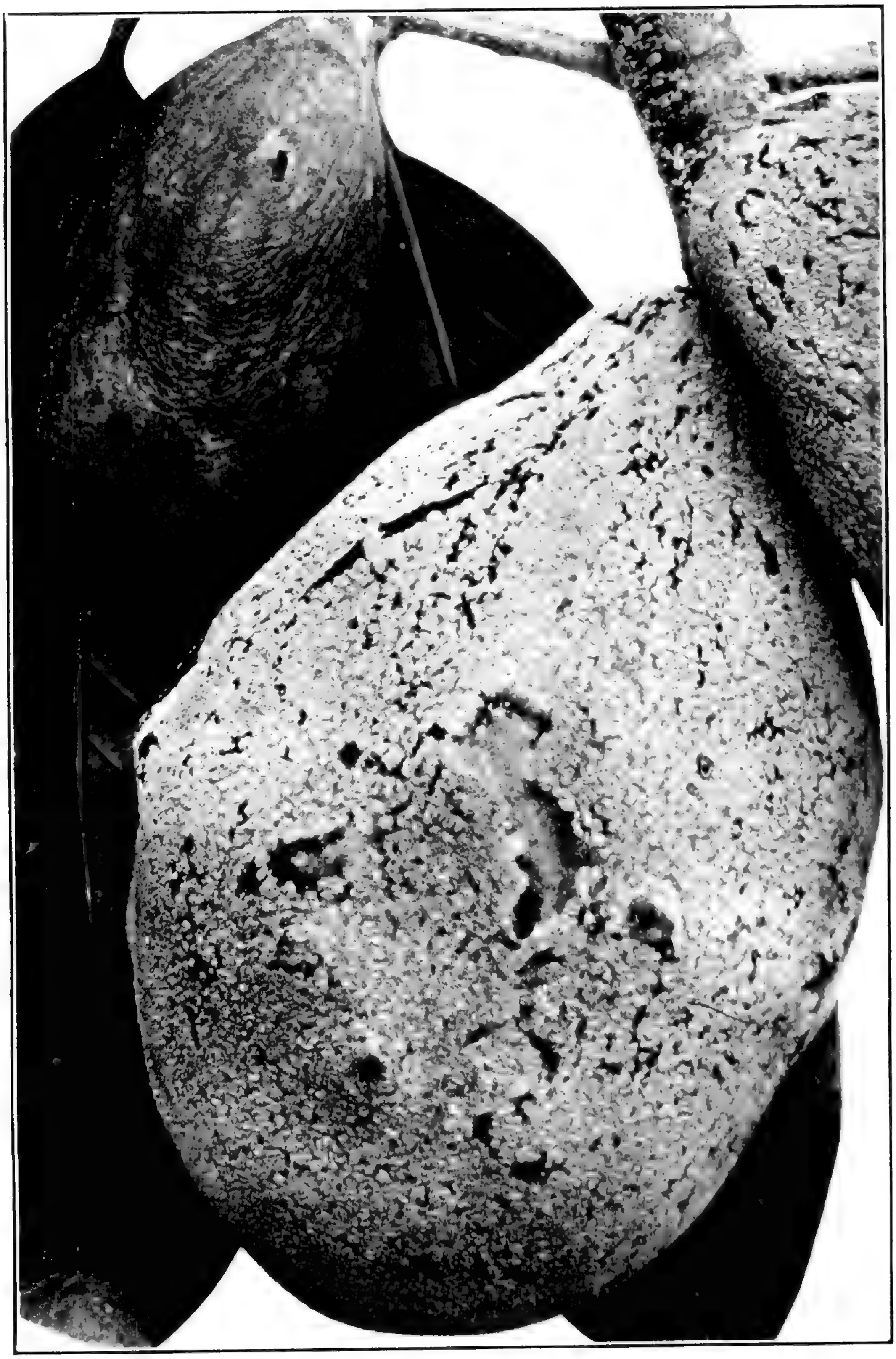
NICARAGUA: Neighborhood of Granada, cultivated, *Levy* 222, in Herb. Kew.

GUATEMALA: Mazatenango (Suchitepequez), alt. 400 meters; *Heyde & Lux*, flowers, January, 1894, *Donnell Smith* 6421; Gualán (Zacapa); fruit December 30, 1905, *Kellerman* 5670.

BRITISH HONDURAS: Belize Botanical Station, *Campbell.*

But for a few small discrepancies and a difference in the vegetative condition, our Costa Rican specimens agree with both Hemsley's description and the Guatemalan specimens of Heyde and Lux. The early deciduous bracts and bracteoles had not yet been noticed. The cup-like receptacle was described as hairy inside, whereas it is smooth or pubescent, and made into a tight-closed cell by the heavy hair crown on its rim. The distichous arrangement of the leaves and branchlets of the inflorescence is another remarkable feature of this tree.

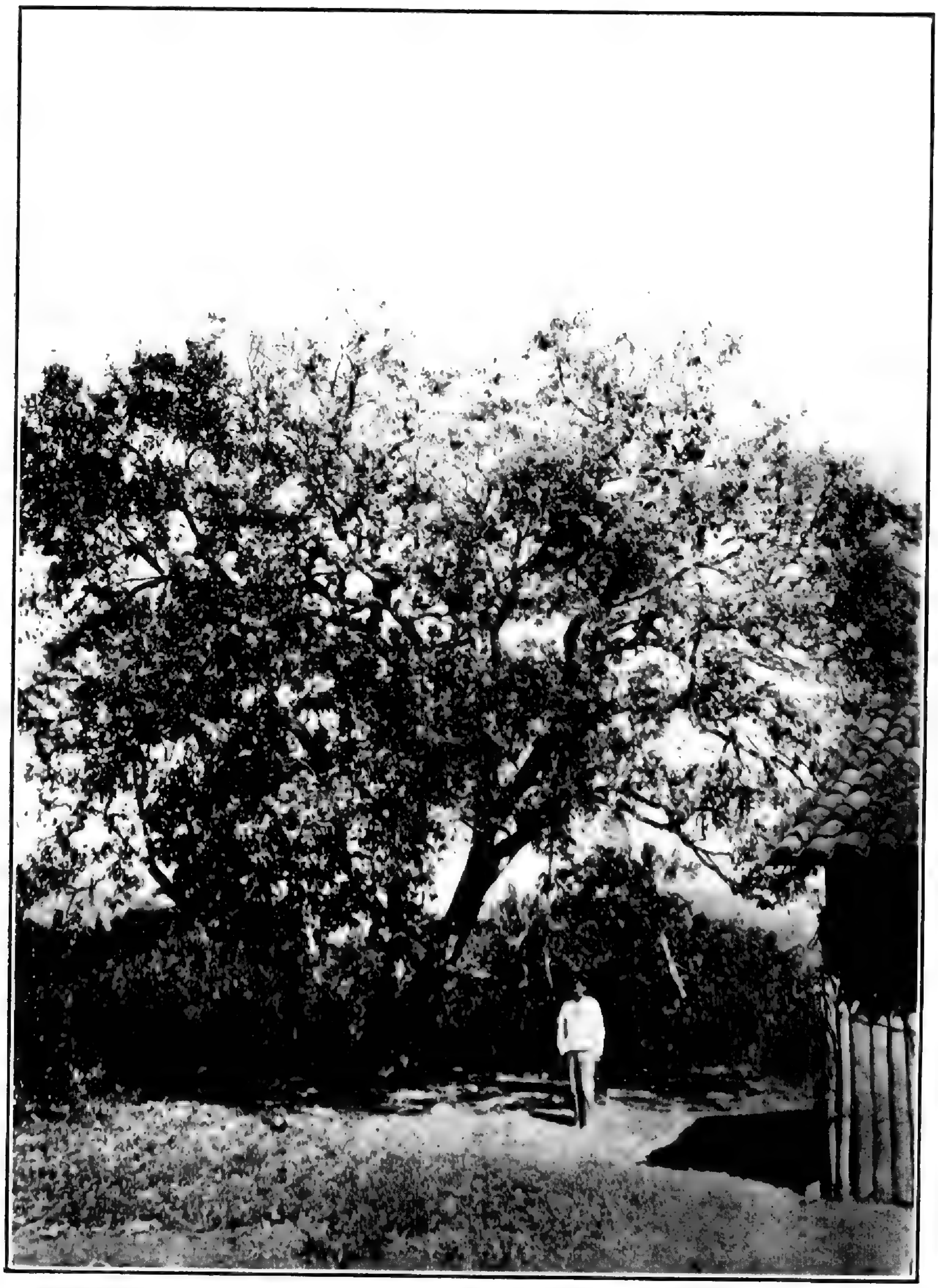
It is probable that *Licania platypus* is a deciduous tree, the flowers of which are borne on the foliated shoots produced in the same season. It attains very large dimensions and, when isolated in the open, has a stately appearance. Although I have seen it at many places in Guatemala (Zacapa, Jocotan), Salvador (Sonsonate, Nahuizalco, Sta. Tecla, Auachapan), and Costa Rica (Guanacaste, Santo Domingo, Barú, Boruca, Talamanca), it was never met with in a truly wild state. A curious fact is that the Brunka and Térraba Indians of Costa Rica do not seem to have any original expression to designate it and call the fruit simply *zapote.* Among the Bribri Indians of Talamanca, the tree is known under the name of *bekom.* In Guanacaste and Nicaragua it is called *sonzapote,* in Salvador *árbol de pan,* in Guatemala



LICANIA PLATYPUS (HEMSL.) PITTIER.



COUEPIA FLOCCOSA FRITSCH.



COUEPIA FLOCCOSA FRITSCH.

*sunza* and *chaúte*, and in British Honduras *monkey apple*. The fruit, which looks and tastes like anything but an apple, is certainly worth more than the predilection of a monkey, being rich and sweet with a slight acidulous flavor, and, according to Mr. G. N. Collins's judgment, superior to the common zapote.

EXPLANATION OF PLATE 86.—Stems with leaves and fruit. From a photograph by Cook, Collins & Doyle, taken at Nicoya, Costa Rica, in 1903. Natural size.

**Licania arborea** Seem. Bot. Voy. Herald 118. *pl. 25*. 1852–53.

This tree does not seem to have been noticed again since Seemann's memorable botanical explorations in Panama in the years 1846 to 1849. Its occurrence in Guatemala is therefore worthy of mention. But for a few minor details, our specimens agree closely with the original description, founded, as it seems, on Cuming's samples in the Kew Herbarium collected in Veraguas about 1829.

*Licania arborea* is a stately tree in its bearing, somewhat like *Anacardium rhinocarpus*. Under the name of *roble blanco* it has a limited use as heavy timber. The following are additional data completing Seemann's description and showing at the same time the discrepancies noticed in our specimens.

A tree 20 to 25 meters high. Floriferous branchlets mostly glabrate, verruculose. Mature leaves 10 to 15 cm. long, 4.5 to 10 cm. broad, glabrous, coriaceous, almost shiny above, glaucous and beautifully reticulate, with the main and secondary nerves very salient beneath; tips mostly rounded, often apiculate or also subemarginate. Rachis of inflorescence and calyx of flowers thickly brown-tomentose. Sepals 1 to 1.2 mm. long, 1.5 mm. broad at base. Petals very small (about 1.2 mm. long, 0.6 mm. broad, hairy-ciliate and early deciduous. Stamens unequal, 1.5 to 2 mm. long, adnate for about 0.7 mm. of their length at the base, villous. Style nearly 3 mm. long.

GUATEMALA: Dry hills of the valley of Ingiatie (Chiquimula), alt. about 900 meters, flowers, January 24, 1907, *Pittier*, 1899.

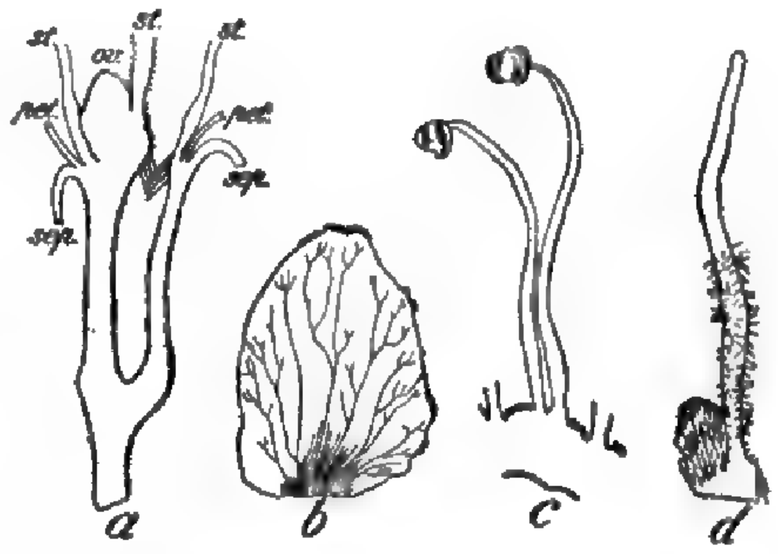


FIG. 69.—*Couepia floccosa*, section and details of flower. *a*, Schematic longitudinal section of the flower; *b*, petal; *c*, stamens, showing also adnate part at the base; *d*, ovary and style. Scale 3.

**Couepia floccosa** Fritsch, Ann. Naturhist. Hofmus. Wien **5**: 12. 1890.

PLATES 87, 88. FIGURE 69.

A medium-sized tree, with gray, scaly bark, and spreading branches.

Leaves persistent, petiolate. Petioles 5 to 10 cm. long, rather thick, subcanaliculate, pale brownish tomentose. Leaf blades ovate, 5 to 8 cm. long, 2.5 to 5 cm. broad, subattenuate at base, rounded or obtusely acuminate at tip, rather thick, dark green and smooth above, whitish and tomentose with prominent main and secondary nerves beneath. Stipules small (5 mm. long), acute, deciduous.

Inflorescence racemose, simple or compound, the individual racemes 3 to 7 cm. long, in the axils of the leaves on the newly formed branchlets, 15 to 50 flowers to the raceme. Rachis, peduncles, and pedicels tomentose and sulcate (in the dry condition). Bracts at the base of the racemes short, triangular, acute, deciduous. Flowers pedicellate, in alternate, dichotomous clusters, 3 to 9 in each cluster. Floral bracts narrowly lanceolate, 5 to 6 mm. long. Pedicels 5 to 7 mm. long, articulate in the middle. Receptacle tomentose, sulcate, funnel-shaped or subcylindrical about 4 mm. long, with a lateral, tubular cavity, smooth inside and provided at the throat with long, stiff, retrorse hairs. Sepals ovate, obtuse, 4 mm. long, 2.5 to 3 mm. broad. Petals pinkish yellow, 4.5 to 5 mm. long, 3.5 mm. broad, more or less sparsely ciliate. Stamens 15 to 20, almost all fertile, inserted on a ring 1 mm. broad, covered inside with retrorse hairs; filaments 5 to 6 mm. long (above the ring), slender, glabrous; anthers small, rounded. Ovary densely hairy; style about 7.5 mm. long, hairy on its lower half.

Fruits fleshy, 1 to 3 to each floral raceme. Pedicel thick, 10 to 15 mm. long. Drupe 6 to 8 cm. long, 3 to 4 cm. in diameter, yellowish green, verrucose outside, with a yellow succulent mesocarp. Stone 5 to 6.5 cm. long, 2 to 2.5 cm. in diameter.

COSTA RICA: Guanacaste, Friedrichsthal;[a] Nicoya, alt. 135 meters; *Tonduz*, flowers, March, 1900 (Instituto fís. geog. Costa Rica, no. 13858); *Pittier*, flowers, May, 1903 (Instituto fís. geog. Costa Rica, no. 16689); *Cook & Doyle* 681, flowers and fruit, May 22, 1903 (U. S. National Herbarium).

EXPLANATION OF PLATES 87, 88.—Pl. 87, inflorescence and fruits. From a photograph by Cook & Doyle. Pl. 88, landscape in Nicoya, showing olosapo trees. From a photograph by H. Pittier, January 1, 1904.

Very nearly related to, if not identical with, *Couepia polyandra* (H. B. K.) Rose (*C. kunthiana* Benth.), of the western coast of Mexico, from which our specimens differ by the leaves being more rounded at the base and tip, the inflorescence much denser, and the flowers nearly half smaller. The name *floccosa* applies as well to one species as to the other, since in both the younger leaves are covered with the same floccose indument. The pubescence on the inner side of the staminal ring is apparently longer and thicker, and the hairs at the base of the style are more markedly retrorse

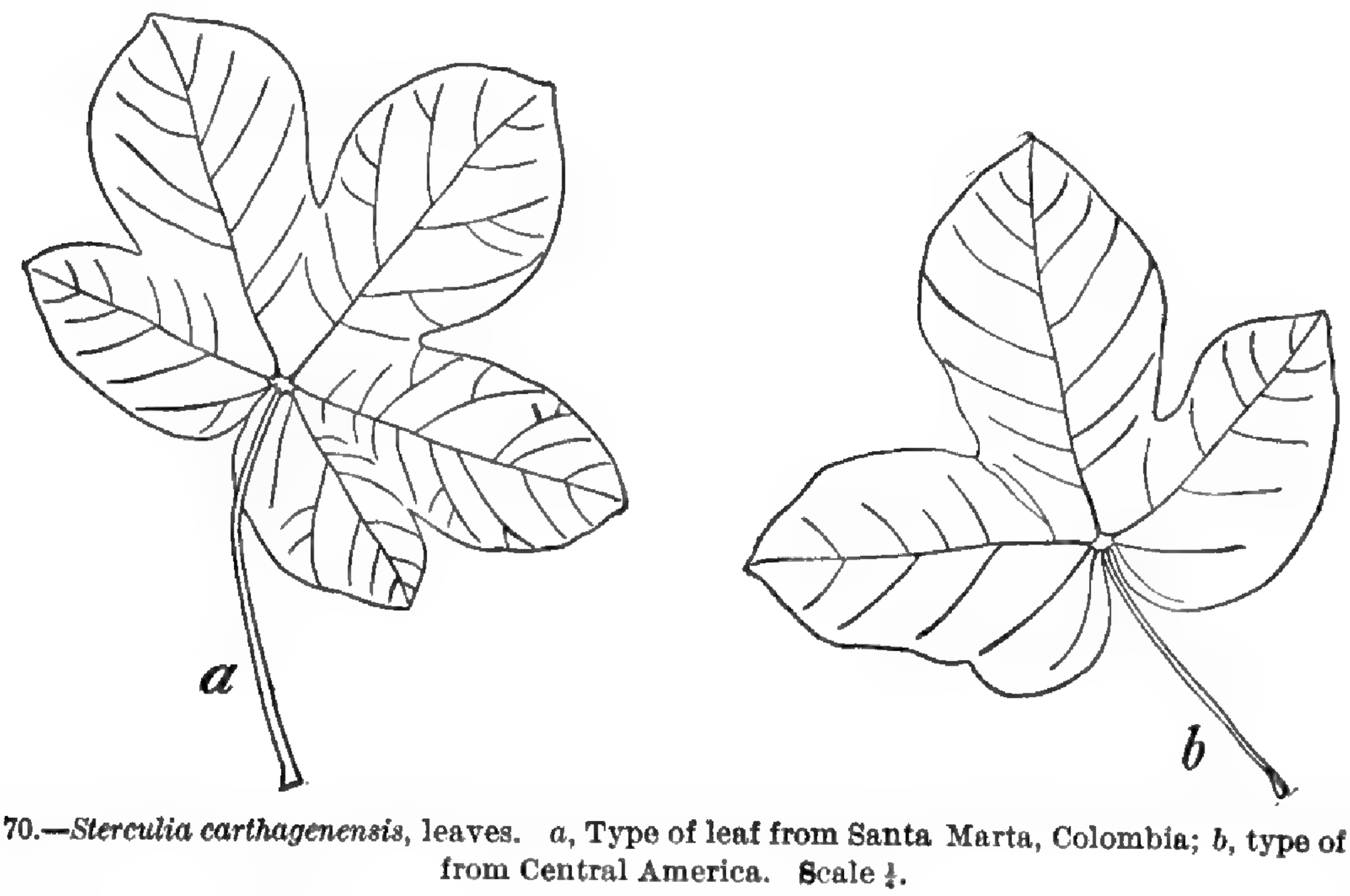



FIG. 70.—*Sterculia carthagenensis*, leaves. *a*, Type of leaf from Santa Marta, Colombia; *b*, type of leaf from Central America. Scale ¼.

in the Mexican species than in the Costa Rican one. There seems to be also a considerable difference in the form and size of the fruit and in the outer texture of the stone.

As already noted by Fritsch (loc. cit.) this species may be considered as a transitional stage between Couepia and Hirtella, shown by the reduced number of the stamens. It may be added that these appear to be in a single series and evenly distributed around the staminal ring. The cavity of the receptacle is obstructed at its opening by a traplike arrangement, the object of which may be to detain certain insects. In many cases, however, the tube is found to be eaten through at the base, showing how the intended victims avoid the obstacle.

*Couepia floccosa* blooms in Nicoya from the beginning of March, at the time of the earlier showers, to May, when the first fruits are also reaching maturity. When I visited the same trees for the second time, in January, 1904, they were in full leaf, notwithstanding the dryness of the season, the leaves being mainly new and growing on shoots that were evidently a product of the latter part of the preceding rainy season The specimens at hand show that the floral racemes of the next crop, at the opening of the following wet period, develop in the axils of that latter growth.

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[a] Fide Fritsch, loc. cit.

It is not known whether this tree really grows wild, it being always seen around houses or in cultivated places, where it is tolerated on account of its fruits, characterized by Mr. G. N. Collins, of the Department of Agriculture, as "highly aromatic and delicious." This fruit has been known and prized by the natives for a long period under the name of *olosapo*, used both in Nicoya and Nicaragua, and probably derived from the Nahuatl *olozapotl*, a round zapote. In Nicoya it is also known under the name of *zapotillo*[a] or small zapote.

## STERCULIACEAE.

### AN OLD AND A NEW SPECIES OF STERCULIA.

**Sterculia carthagenensis** Cav. Monad. Diss. **6**: 353. 1790.

PLATE 89. FIGURES 70–76.

A portly tree with a straight trunk 25 to 30 meters high and a flat, densely leafy crown. Limbs horizontal and divaricate.

Leaves large, long-petiolate, deeply cordate, palmatilobate. Petioles 10 to 13 cm. long, subsulcate and more or less shaggy-hairy. Leaf blade 3 to 5-lobate, 10 to 15 cm. long, 18 to 24 cm. broad, more or less smooth and shiny above except at the base of the five main nerves, sparsely to densely felted beneath with short penicillate hairs; middle lobe ovate, slightly contracted at base, subacute; lateral lobes usually overlapping each other at the inner side.

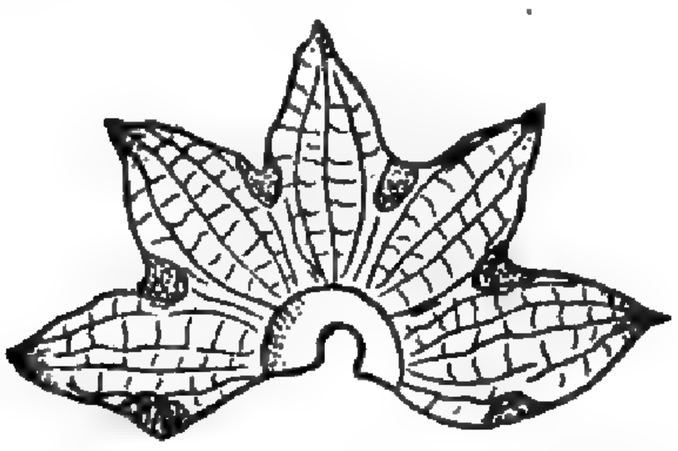


FIG. 71.—*Sterculia carthagenensis*, corolla of male flower, spread out. Specimen from Santa Marta, Colombia. Natural size.

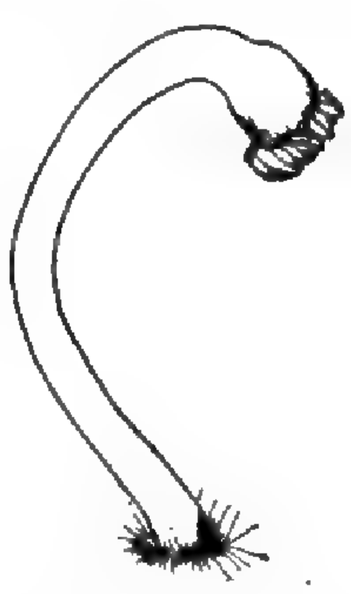


FIG. 72.—*Sterculia carthagenensis*, androphorum of male flower. Specimen from Santa Marta, Colombia. Scale 3.

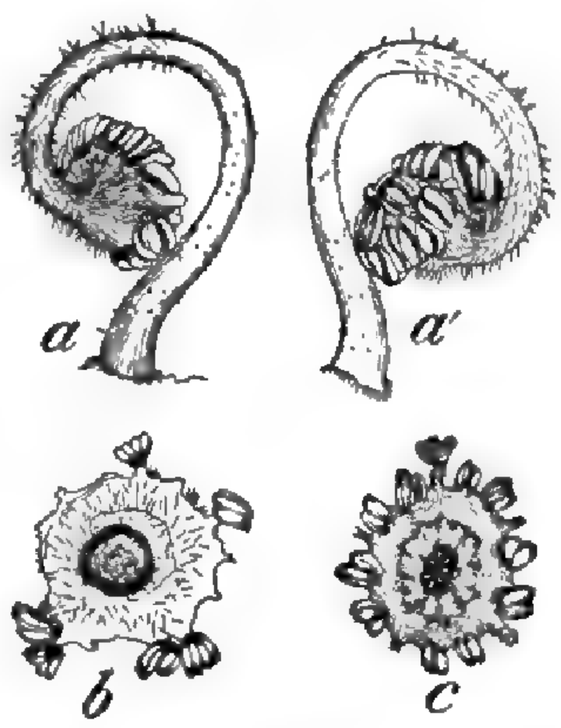



FIG. 73.—*Sterculia carthagenensis*, androphorum and parts. *a*, *a'*, Whole androphorum (Guatemala, *Donnell Smith*, 2545; *b*, staminal tube of same with a few stamens; *c*, staminal tube (Santa Marta, Colombia, *H. H. Smith* 1889) with glandulose filaments. Scale 3.

Panicles axillary at the end of the branchlets, large, racemose, unisexual, or bearing both male and hermaphrodite flowers; main rachis and ramifications densely covered with penicillate hairs, the former 25 cm. long and above. Bracts and bractlets early deciduous, small and densely hairy. Pedicels of mature flowers hairy, 1 to 2 cm. long. Calyx of male flowers rather large (1.5 to 1.8 mm. in diameter), about 18 mm. long, broadly campanulate, dirty yellow and diversely tinged with purple spots and lines, thickly covered outside with a filmy layer of very thin, multicellular filaments, mixed with purple or colorless penicillate hairs (fig. 76, *a*); the bottom inside showing a flat, golden yellow, glandular-appearing zone, about 7 mm. in diameter, sending 5 dark parallel nerves into each lobe; interlobular sinuses usually marked at the angle by a large black spot; lobes broadly triangular, 7 to 8 mm. long and broad at the base, obtuse or more or less acuminate. Androphorum 10 to 12 mm. long, inflexed, sparsely covered with thick, obtuse, multicellular hairs for its whole length or these mixed at the upper part with longer glandular hairs (fig. 76, *b*); staminal tube ovate, hardly thicker than the androphorum and about 1.3 mm. long, minutely covered with fine,

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[a] See H. Pittier, Ensayo sobre las plantas usuales de Costa Rica (1908), p. 142, where this tree is given as the Mexican *Couepia kunthiana* Benth.

straight, multicellular hairs, or else broadly shallow salver-form, about 1 mm. deep and then covered with the same long glandular hairs found on the androphorum; stamens crowded, 7 or 8 in the first form, 12 to 15 in the second, biseriate, short-stipitate or sessile; rudiment of ovary small, 5-winged, glabrous; stigma 5-lobulate, yellow. Calyx of the female flower same as in the male one, but often larger; gynophorum 6 to 7 mm. long, otherwise like the androphorum; staminal tube shallow-cupuliform and broad, about 3 mm. in diameter and bearing 12 to 16 more or less distinctly biseriate stamens, alternately 2 short and 1 long, stipitate (that is to say, in the case represented in figure 73*a*, *a'*, 10 in the outer or lower series and 5 in the inner series).

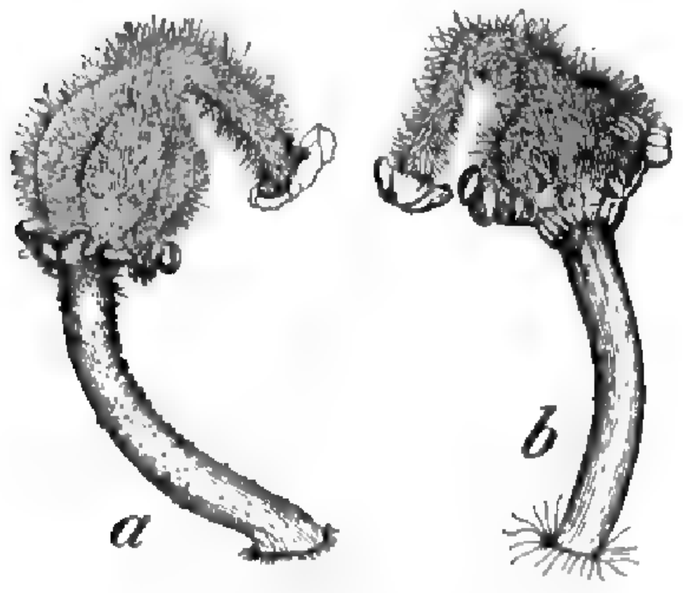



FIG. 74.—*Sterculia carthagenensis*, gynophorum. *a*, Specimen from Costa Rica (*Pittier* 2025); *b*, from Santa Marta, Colombia (*H. H. Smith* 1889). Scale 3.

Ovary globose or ovoid, about 2 mm. in diameter, covered as is the style with a dense growth of penicillate hairs, and composed of 5 free, erect, 2 to 5-ovulate carpels; style reflexed, about 4 mm. long; stigma capitellate, more or less flat-conical and rounded at tip, obscurely 5-lobulate. Carpids 5, reflexed on a thick peduncle, 20 cm. long, obovoid, about 6 cm. long and 4 cm. thick, glabrescent, opening on the upper (ventral) suture, coated inside with a dense layer of erect, stiff, yellowish prickly hairs over 2 mm. long, and containing two to four black seeds. Seeds ovoid, about 2 cm. ong and 1.3 cm. in diameter; episperm thin, shiny black, covered also with stiff, little adhesive, prickly hairs and followed inside by a layer of greasy, soap-like substance.

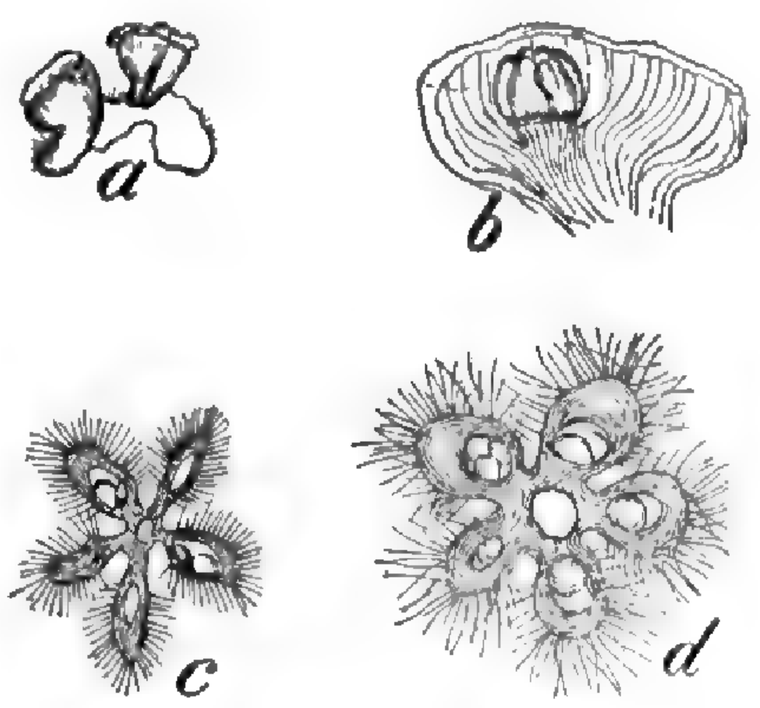



FIG. 75.—*Sterculia carthagenensis*, floral details. *a*, Stamens; *b*, rudiment of ovary on androphorum; *c*, *d*, cross sections of ovary. *a–c*, Material from Santa Marta, Colombia; *d*, from Costa Rica. Scale 6.

COLOMBIA: Forests around Cartagena (type locality), *Jacquin*, local name *camajonduro;* same locality, *Triana;* Calamar, *Triana;* Santa Marta (Magdalena), alt. 165 meters, flowers, February, *H. H. Smith* (U. S. National Herbarium); around Rio Frio, *Pittier*, local name *camajurü;* around Barranquila, *Pittier*.




FIG. 76.—*Sterculia carthagenensis*, hairs of calyx and androphorum. *a*, One of the penicillate hairs covering the calyx and other parts; *b*, glandular hairs found on the androphorum. Scale 16.

PANAMA: Around Panama City, *Seemann, Hayes* (local name *panamá*).

COSTA RICA: Puntarenas, on the Pacific coast, *Biolley*, flowers, February, 1907; *Pittier* 2025 (U. S. National Herbarium no. 578423); also on the Atlantic coast, seen at Chirripó farm, Zent Plains, in the forest, and elsewhere, *Pittier;* local name *panamá* (Pittier).

NICARAGUA: Without precise locality, but on the western coast *C. Wright* (U. S. National Herbarium no. 12983); Granada, *Baker* 2441, flowers, February 17, 1903 (U. S. National Herbarium no. 398767).

SALVADOR: Around Sonsonate, alt. 100 meters, *Renson*, young flowers (U. S. National Herbarium no. 399532); local name *castaño* (Pittier).

GUATEMALA: Naranjo (Escuintla), alt. 100 meters, flowers March 29, 1892, *Donnell Smith* 2545 (U. S. National Herbarium no. 12982).



FRUIT OF STERCULIA CARTHAGENENSIS CAV.

YUCATAN AND TABASCO: *Johnson.*[a]

JAMAICA: Kingston; Donnell Smith, flowers, February 17, 1894 (U. S. National Herbarium no. 409325); Devon Pen, *E. Campbell*, leaves only (U. S. National Herbarium no. 521778); said to be introduced from Colombia or Panama.

PORTO RICO: Magueyes (Ponce), *Goll* 782, flowers, November 25, 1899 (U. S. National Herbarium no. 409325); Ponce, *Nina Prey* 66, flowers and fruit, March 5, 1903 (U. S. National Herbarium nos. 845684–86; local name *anacagüite* (*Nina Prey*).

EXPLANATION OF PLATE 89.—Fruit with three of the carpids open showing seeds. From a photograph taken in Washington of a specimen received from Panama in 1910. Natural size.

This species is quite variable and may be subdivided into several local forms, which one would be tempted to call species but for the fact that all possible intermediary stages seem to occur. The leaves (fig. 70, *a*, *b*), very variable in size, are at times only trilobate, at others divided into five lobes, the four lateral ones being of the same size and independent from each other. These divisions are either obtuse or acute, and the median lobe is more or less narrowed at the base. In the Santa Marta specimens, which should be nearer to Cavanilles type, the tomentum of the lower face of the leaf is thick and very soft to the touch, even in older leaves, and this applies also to the Porto Rican and Salvadorean specimens; in all Central American specimens but the latter the villosity is much less dense, the stellate bushy hairs being easily singled out under the lens. The floral racemes of the Santa Marta tree bear at the same time male and hermaphrodite flowers, and the same can also be said of the Puntarenas material, while in all the other specimens of the National Herbarium the racemes seem to be either entirely male, the most frequent case, or entirely hermaphrodite. Great variation is also observed in the pubescence of the androphorum and gynophorum and staminal tube, the latter being also variously shaped according to locality. Thus in H. H. Smith's samples, coming, as explained, from the locality nearest to Cartagena, both the androphorum and gynophorum are sparsely covered for their whole length with short, obtuse hairs, while on the staminal tube the pilosity is extremely minute and can hardly be distinguished with an ordinary lens; the staminal tube of the male flowers is scarcely broader than the androphorum, rather elongate, and bearing less than ten stamens (fig. 72*a*). In all the Central American samples but the one from San Salvador, the flowers of which are immature, the androphorum and gynophorum have at the base the same short sparse hairs, but their upper part, as well as the staminal tubes, is covered with glandular stiff hairs such as are represented in figure 76 *b;* in both the male and hermaphrodite flowers the staminal tube is broad and rather flat, with 12 to 14 stamens. There are also sensible differences in the form and size of the ovary complex and of the stigmas, so that one would easily be induced to segregate the two forms but for the fact that those ostensible differential characters are found together in the Jamaican and Porto Rican specimens. I am inclined, therefore, to follow Robert Brown[b] so far as to include in one polymorphic species, *S. carthagenensis* Cav., the specimens from the Caribbean coast of Venezuela and Colombia, Central America, and the West Indies, but excluding *S. chicha* St. Hil. from Brazil, which, judging by the specimen from Sellow (no. 1445), differs not only by the shape and texture of the leaves, but also by its simple floral racemes, its smaller flowers, its densely hairy androphorum and gynophorum, and doubtless by other characters.

**Sterculia costaricana** Pittier, sp. nov. FIGURES 77, 78.

A small tree, about 5 meters high.

Leaves simple, entire, long-petiolate, quite glabrous, crowded at the ends of the branchlets; petioles 2.5 to 5 cm. long, slender, rounded, slightly thicker toward the

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[a] Biol. Centr. Amer. Bot. **1**: 126.

[b] Bennet, Pl. Jav. 228. 1838.

upper end; leaf blades 5 to 12 cm. long, 4 to 7 cm. broad, ovate, obtuse at base, ending abruptly in a very sharp and narrow acumen; upper face light green, showing the impressed venation; lower face pale, glaucous, with a more or less pinkish hue, the main nerves, veins, and anastomosing venules quite prominent. Stipules early caducous, 8 mm. long, 5 mm. broad at base, ovate-acute, almost subulate and hairy at the tip, purplish or brownish with numerous dark striæ.

Panicles axillary at the ends of the branchlets, simple, up to 6 cm. long, the rachis and pedicels hairy-tomentose. Bracts early deciduous, about 8 mm. long, conch-like and acute at the tip, minutely hairy outside, dark-colored and striate. Pedicels 5 mm. long. Calyx of the male flower dark brown in dry specimens, densely gray-tomentose outside, hairy inside, 9 mm. long, deeply 5-cleft; segments linear-lanceolate, subacute, 6.5 mm. long, 2 mm. broad, with 3 to 5 dark longitudinal lines and a short, barbate appendage transversely inserted at the middle. Androphorum filiform, 5.5 mm. long, thickened and covered with short, many-celled, apparently glandular hairs at the base, smooth above; staminal tube pendulous, small, salver-shaped or suburceolate, glabrous; anthers 10, biseriate, stipitate, crowded, the 5 exterior ones larger; rudiments of the pistil quite obsolete. Calyx of the female (or monoclinous) flowers as in the male flower but larger (about 11 mm. long), the lobes half spreading, nearly 9 mm. long, 2.5 mm. broad at the base. Gynophorum suberect, thick, glabrous except at the enlarged base (as in the androphorum), about 5 mm. long; staminal tube cupuliform, glabrous, about 2 mm. in diameter and 0.8 mm. high; stamens 10, those of the outer series conspicuously larger. Ovary depressed-globose, with 5 separate carpels and densely covered, as is the style, with coarse, unicellular, bifurcate or trifurcate hairs, the style thick, 1.8 mm. long; ovules in each carpel 4 to 6; stigma capitellate, indistinctly 5-lobulate, glabrous. Mature carpids 5, large (10 to 15 cm. long and up to 12 cm. in diameter), obovate, borne on a thick peduncle 10 cm. long.

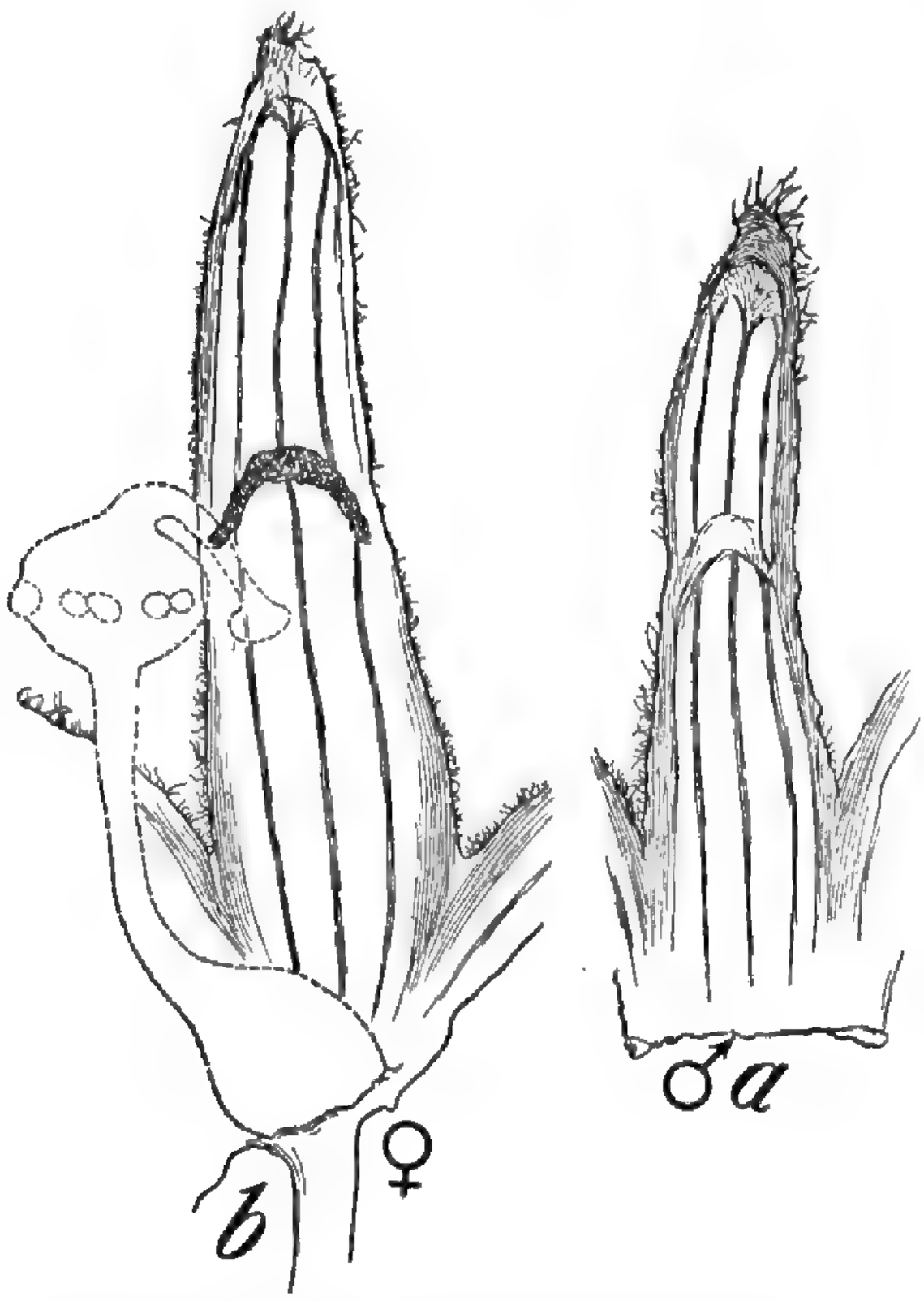



FIG. 77.—*Sterculia costaricana*, corollas of (*a*) male and (*b*) female flowers, showing comparative size. Scale 6.

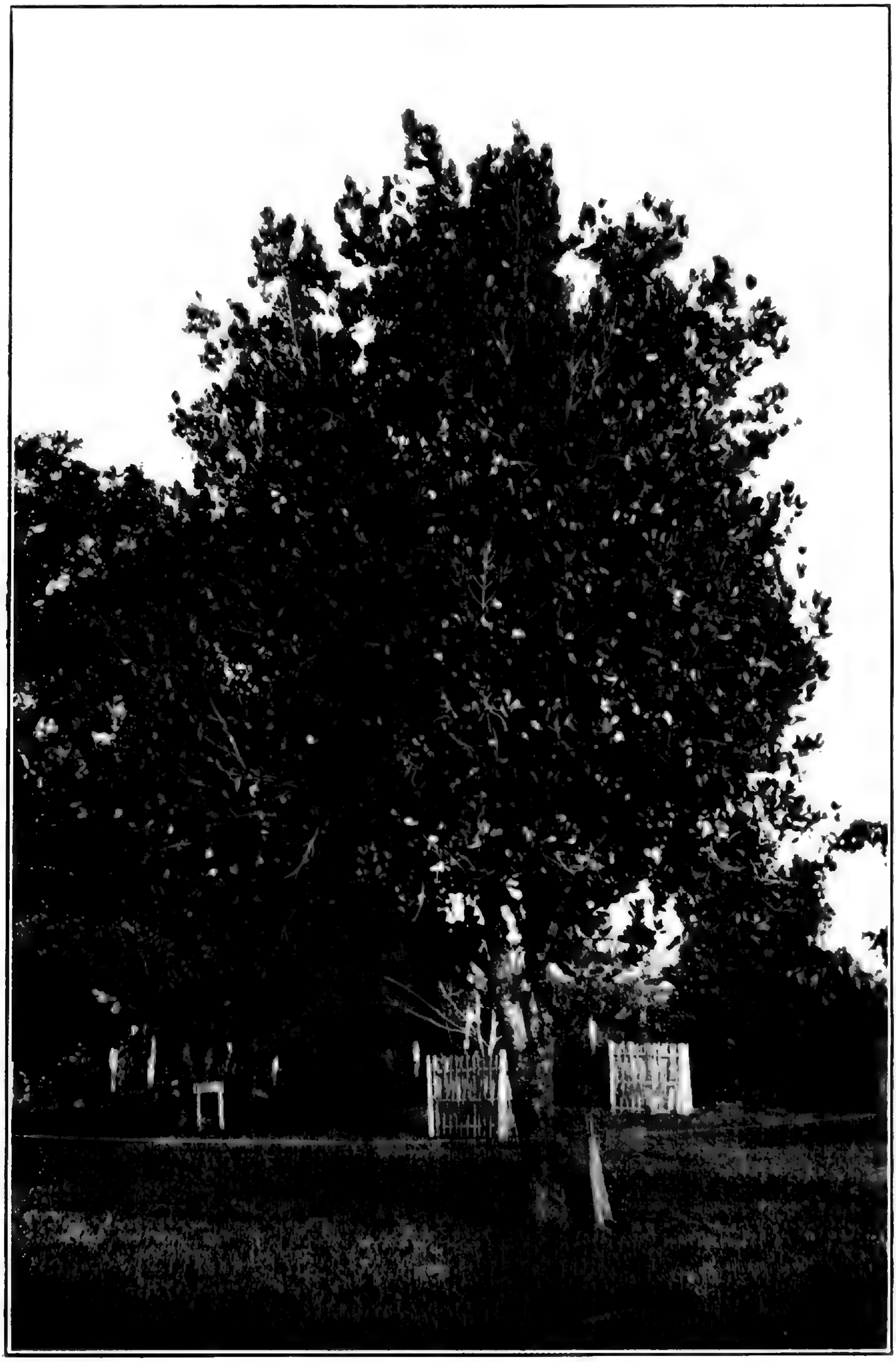
Type in the U. S. National Herbarium, no. 578036, collected at Las Delicias del Reventazon, plains of Santa Clara, altitude about 40 meters, September, 1901, by H. Pittier. Flowers and fruits. Same in Instituto fís. geog. Costa Rica (no. 16172).

## GUTTIFERAE.

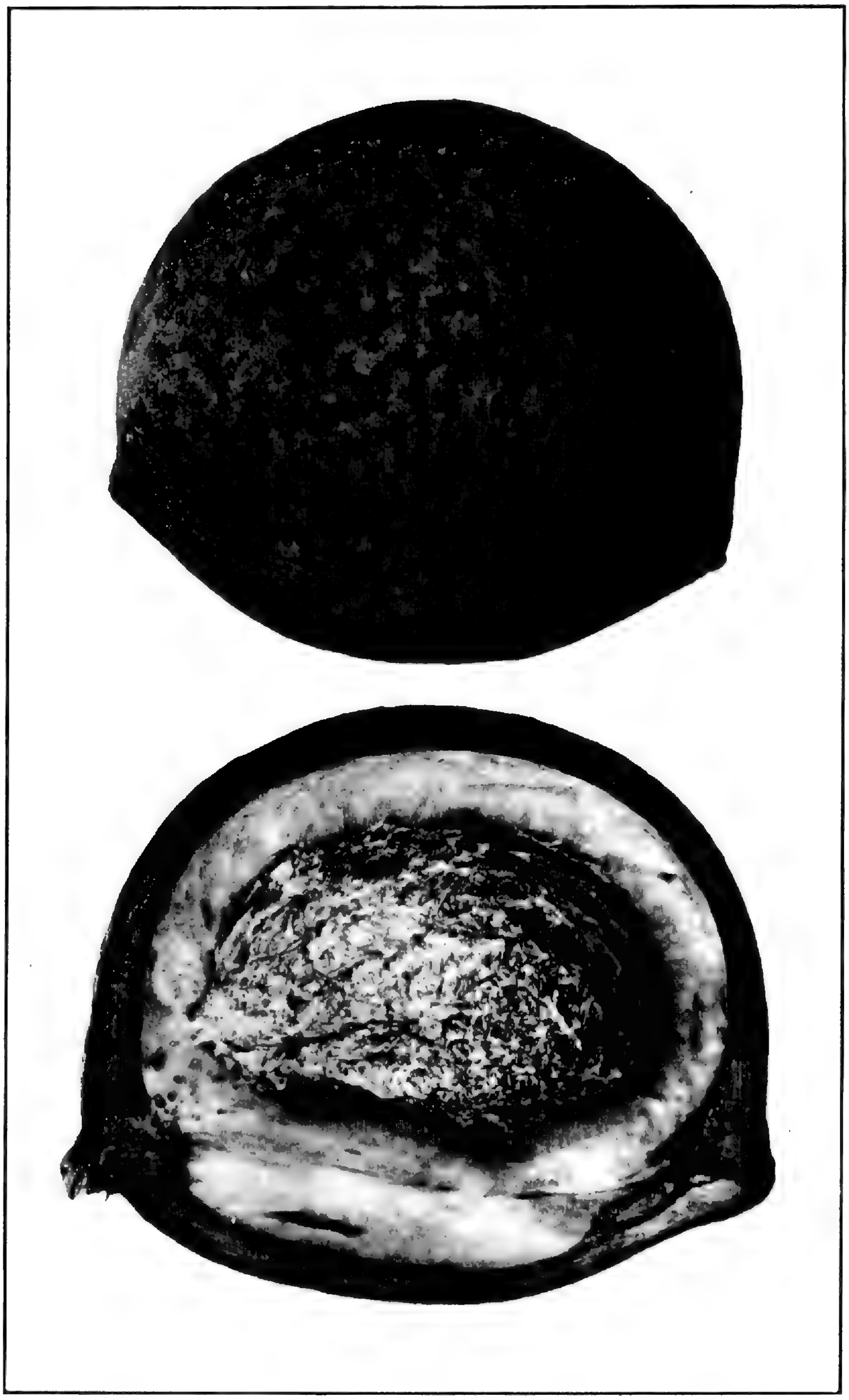
### OLD AND NEW SPECIES OF SEVERAL GENERA.

**Hypericum epigeium** Keller, Bull. Herb. Boiss. II. **8**: 183. 1908. FIGURE 79.

A dwarf, suffrutescent plant, with underground stems emitting numerous, mostly simple branchlets, 10 to 20 cm. long, more or less densely foliose, 4-angled. Leaves elliptic, amplexicaul, obtuse or rounded at tip; intraparenchymatous glands mostly



MAMMEA AMERICANA L.



MAMMEA AMERICANA L.

large and appearing to the naked eye, on dry specimens, as so many black dots; main nerve prominent on the lower face, groovelike on the upper face. Flowers solitary at the ends of the branchlets. Sepals ovate-lanceolate, unequal, acute at the tip, often slightly constricted at the base, in our specimens measuring from 3 to 4.5 mm. in length with a breadth of 1 to 2.5 mm. Petals obovate, rounded at tip, short-unguiculate, persistent, 8 to 9 mm. long, 3 to 3.5 mm. broad, the 5 basal veins branching dichotomously into the lamina. Stamens 16 to 20, 5 to 7 mm. long, shortly adnate at the base. Ovary ovate, 3-grooved outside, 3-celled, about 3 mm. long; styles 3, 3 to 3.5 mm. long, slightly protruding above the stamens.

Except for the stamens being shortly adnate, our specimens agree closely with Keller's description of Mr. Donnell Smith's plant, distributed by the latter under the name of *H. mexicanum*.

GUATEMALA: Volcan de Agua, 3,899 meters (?), flowers, April, 1890, Donnell Smith distribution, no. 2147; same locality, but at about 3,000 meters, *Shannon*, flowers, June, 1892, Donnell Smith distribution, no. 3626; upper slopes of the same volcano, alt. about 3,750 meters, *Pittier* 45, flowers, March 22, 1905.

**Mammea americana** L. Sp. Pl. 512. 1753. PLATES 90, 91.

This is a beautiful middle-sized evergreen tree (10 to 12 meters high), with an oval crown of dense, dark green foliage. The trunk usually divides at a short distance from the ground into several vertical or little diverging limbs. These in turn give birth to smaller branches, which are opposite and spread at a more open angle. On these grow the ultimate leaf and flower bearing twigs. The leaves are thick, not very large (10 to 14 cm. long), obovate or obovate-oblong, cuneate at base and narrowing into a short, broad petiole; the secondary veins are numerous, parallel, and anastomosed by means of many transverse venules. The flowers are borne solitary on the nude twigs or in the axils of leaves; they are polygamous and rather large (about 4.5 cm. in diameter), and both the male and bisexual are found on the same tree. The free stamens are very numerous, with pale yellow anthers. The ovary is ovoid, 2-celled, with two ovules in each cell; the style is short and bears a broad, 2 or 4-lobulate stigma. The fruit is a large berry, 10 to 15 cm. in diameter when ripe; it has a thick skin and a fibrose-pulpy mesocarp, and contains 2 to 4 large stones with a rough, towy-fibrose tegument.

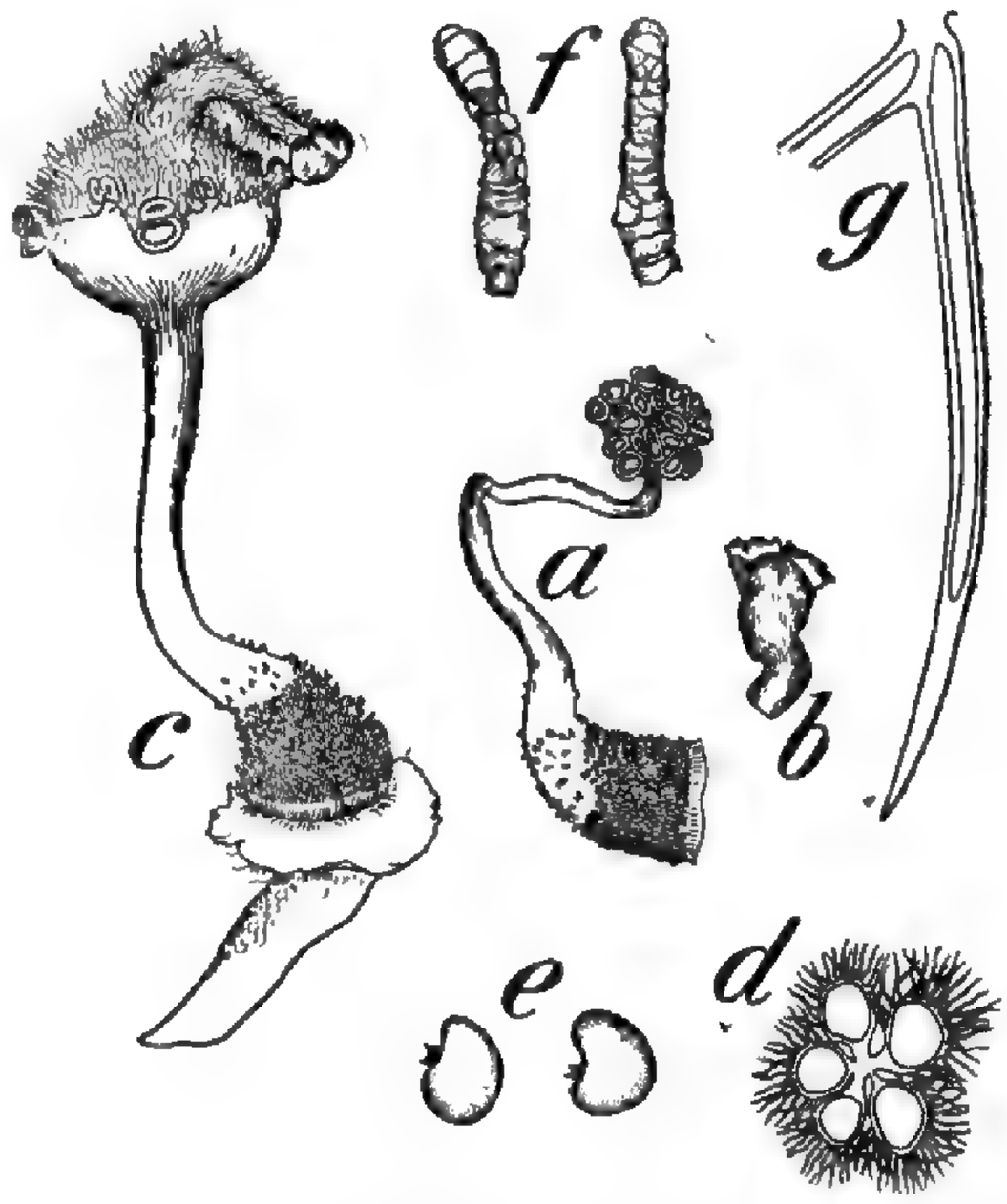



FIG. 78.—*Sterculia costaricana*, floral details. *a*, Androphorum; *b*, lateral view of stamen; *c*, gynophorum; *d*, section across ovary; *e*, ovules; *f*, hairs from those covering base of androphorum and gynophorum; *g*, hair from those covering ovary. *a*, *c*, and *d*, Scale 6; *b*, scale 16; *e*, scale 24; *f* and *g*, scale 100

COMMON NAMES: *Mamey* (Spanish America in general, a name that is said to have originated in the Taíno language of Haiti); *mamey de Cartagena* (Panama, according to Seemann); English, *mammee, mammee-apple* (English West Indies); French, *abricot de Saint Domingue, abricotier d'Amérique;* Brunka, *tšep;* Tirub, *šrú* (both Costa Rican dialects); Misquito, *rurí* (eastern coast of Nicaragua); Cuna, *mámi*, perhaps the real origin of the Spanish name. [a]

[a] See also Lanessan, Les plantes utiles des colonies française; Cook and Collins, Economic Plants of Porto Rico (Contr. Nat. Herb., vol. 8); Jumelle, Cultures coloniales, vol. 2; Pittier, Plantas usuales de Costa Rica.

The flowers of the *mamey* or *mammee* are sweet-scented and used in the French West Indies in the preparation of an aromatic water called *eau des créoles*, said to be refreshing and digestive. But the tree is known mainly through its fruits, which, according to Perrot, attain sometimes 4 kilograms in weight. The thick, juicy mesocarp has a sweet, aromatic taste, remotely suggesting the apricot, and, if this fruit were produced in marketable quantities and were able to stand long-distance transportation, it would constitute a valuable addition to our list of table fruits. It is also made into delicious preserves. The skin is very thick and rather tough and its bitter interior lining has to be removed carefully. The large seeds vary in number, to my knowledge, from 4 to none. Their rough, fibrous surface affords a good means of distinguishing this fruit from that of the zapotillo and the common zapote, which, like the former, sporadically make their appearance in our markets, and often under the same name.

The wood of *Mammea americana* is white, pretty hard, and moderately heavy and splits easily; it is sometimes made into boards or otherwise used for building purposes. According to Lanessan, its density is equal to 0.990, its elasticity to 1,000, and its resistance to 790. The bark exudes a resinous gum, used by the natives of the French

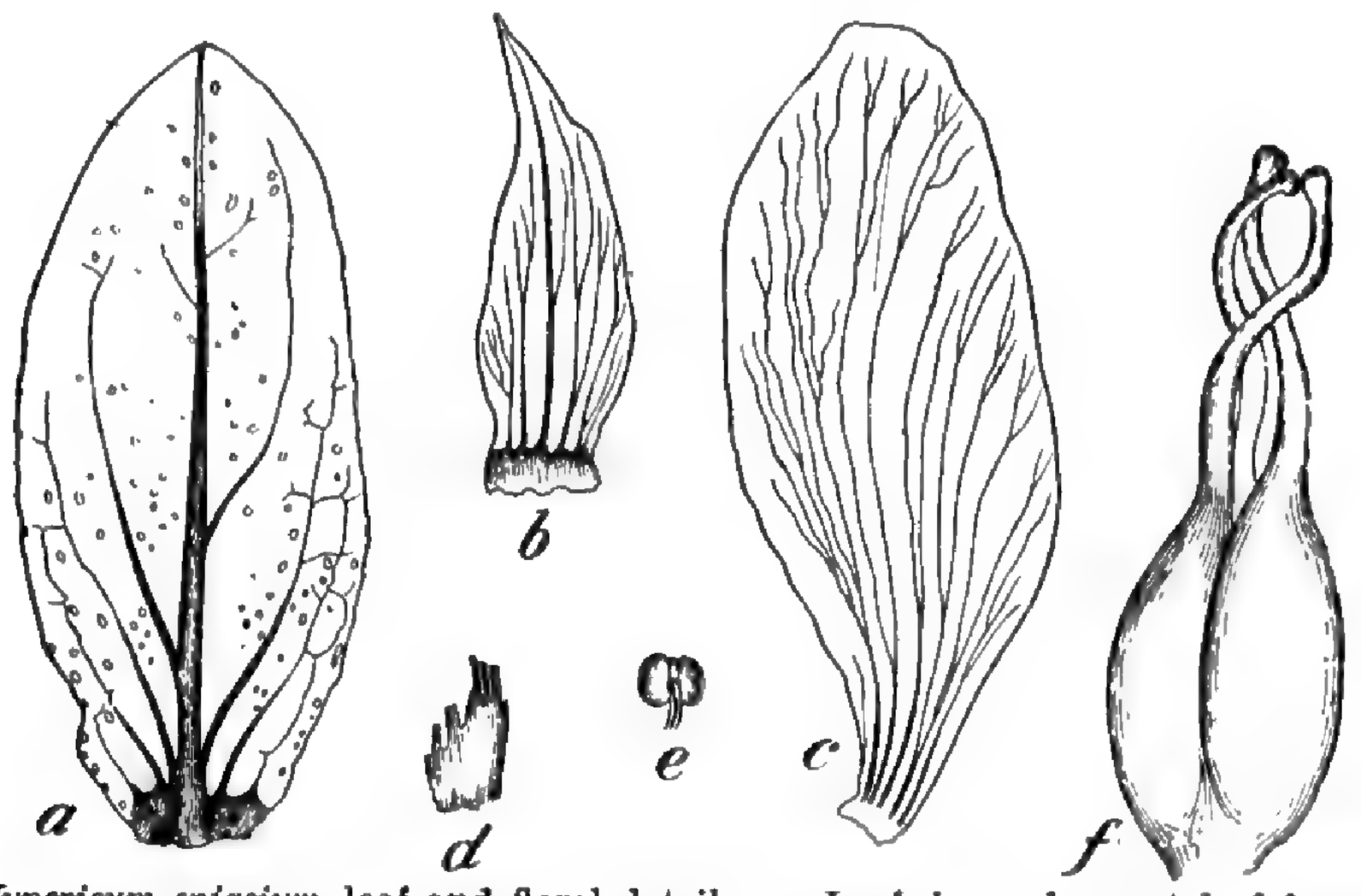



FIG. 79.—*Hypericum epigeium*, leaf and floral details. *a*, Leaf; *b*, sepal; *c*, petal; *d*, base of stamens; *e*, anther, showing insertion of filaments; *f*, pistil. Scale 6.

West Indies to extract the chigoes or sand-flies. In other parts of the Antilles the fermented sap is made into an intoxicating drink called "toddy."

The mamey-tree is a native of the warmer zone (from the sea level to an altitude of about 1,000 meters) of the West Indies, Central America, and the southern Caribbean littoral from the Guianas westward. It is frequent in cultivation all over tropical America, including Brazil and southern Mexico. In Costa Rica I have met it wild only once, between Cañas Gordas and Rio Chiriqui Viejo (i. e., in what is to-day Panamanian territory), but the fact that it has names in two of the aboriginal languages is sufficient proof of its native standing. Seemann collected it near Panama, and according to my personal information it is found wild in the forests of Veraguas. It is apparently of more frequent occurrence, both as a forest tree and a cultivated fruit tree, in the Lesser Antilles and in the Guianas.

EXPLANATION OF PLATES 90, 91.—Pl. 90, tree; pl. 91, fruits, one with part of flesh removed, showing stone. Pl. 90 from a photograph by Pittier & Doyle, taken at La Manuelita, Colombia, 1905–6; pl. 91, from a photograph by G. N. Collins, taken at Ponce, Porto Rico. The latter natural size.

**Clusia uvitana** Pittier, sp. nov.

Section Retinostemon. Low bush, with diffuse, spreading branches.

Petioles 1 to 1.5 cm. long, broad and flattened. Leaf blades obovate, cuneate at base, rounded or subacute at tip, 10 to 14 cm. long, 5 to 6.5 cm. broad; margin revo-

lute; primary veins numerous, catenate (on dry specimens), parallel, distant about 2 mm., diverging from the main nerve at an angle of about 20° and all merging in a marginal vein.

Inflorescences axillary or terminal, much shorter than the leaves, the male ternate with 9 to 13 flowers. Bracts ovate, 5 to 6 mm. long; prophylla semiovate and subacute, about 2 mm. long. Male flowers: Pedicels 6 to 8 mm. long; sepals 4, conchoid, orbicular, the interior about 7 mm. long and 10 mm. broad; petals 5, suborbicular-spathulate, nearly 15 mm. long and 12 mm. broad, dark-striate, the claw 5 mm. long and 2 mm. broad; andrœcium forming a solid, resin-like disk 8 mm. in diameter and 3 mm. high; anthers numerous around the base of the disk (28 to 30 in the lower row, 15 or more in the second row), irregularly scattered and imperfect toward the apex; rudiments of gynœcium wanting. Female flowers not known; presumably solitary, with 8 or 9 stigmas.

Capsule ovoid-globose, 2.5 to 3 cm. long, 2 cm. in diameter, 8 or 9-celled, each cell with many seeds; stigmas 8 or 9, spoon-like, forming a crown about 13 mm. in diameter.

Type in the U. S. National Herbarium, no. 366031, collected on Uvita Island, near Port Limon, Costa Rica, July, 1898, by H. Pittier. The material consists of male fruits and ripe capsules. Same in Instituto fís. geog. Costa Rica (no. 12704).

This species was distributed under the name *C. minor* L., but differs from that species as described by Planchon and Triana[a] by its short petioles, the form of the stigmas, and the details of the capsule. The male flower of *C. minor* does not seem to have been yet described and there is doubt as to the section to which that species should be referred. While our material may in the end be found to belong to this or to some other species previously described, there is a reasonable doubt as to its identity and in the absence of reliable information it seems preferable to record it for the present under a separate name.

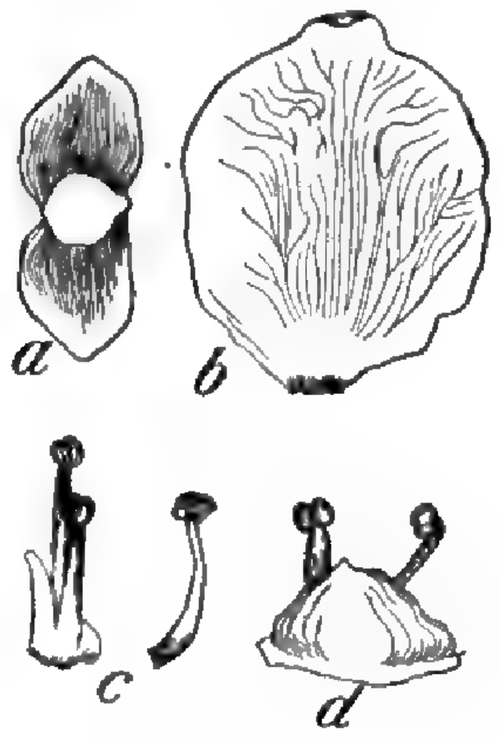



FIG. 80.—*Rheedia edulis*, floral details. *a*, Calyx; *b*, petal; *c*, stamens; *d*, disk with two adhering stamens. *a–c*, From Costa Rican specimens; *d*, from Guatemalan. Scale 3.

**Rheedia edulis** Triana & Planch. Ann. Sci. Nat. IV. **14**: 310. 1860. FIGURE 80.

A forest tree reaching a height of 30 meters. Branchlets tetragonous or 4-sulcate, with dichotomous ramification.

Leaves petiolate, glabrous, coriaceous, the younger ones reddish. Petioles 1 to 1.2 cm. long, canaliculate and subtetragonous, with a short, rather inconspicuous foveola. Leaf blades elliptic-lanceolate, cuneate at base, obtuse-rounded, acute, or acuminate at tip, 5 to 15 cm. long, 2 to 5 cm. broad, dark green above, paler or brownish beneath; main nerve and primary veins prominent on both faces, the latter simple, parallel, and very numerous on the long, narrow leaves, sparser, farther apart, and bifurcate on the more rounded leaves.

"Pedicels of the fertile flowers axillar and geminate. Sepals 2, obtuse. Stamens 10 to 12, persistent."[b] Male flowers 2 or 3-geminate. Pedicels 8 to 15 mm. long and broad. Petals 4, ovate-rounded, often with a ligular, acute appendage at tip, 5.5 to 7 mm. long, 4 to 5 mm. broad, white. Stamens 25 to 30, biseriate, 3 to 4 mm. long. Disk conical, rather flat but acute at tip, about 3.5 mm. in diameter, 1.5 mm. high.

"Fruits about the size of a hazelnut, yellow, one-seeded."[b] "The fruit of *R. edulis* is as large as the largest hazelnuts, but much longer than an olive; it is monospermous" (Wercklé in litt.).

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[a] Ann. Sci. Nat. IV. **13**: 334. 1860.

[b] Seemann, Bot. Voy. Herald 89.

PANAMA: In dark forests near the village of San Lorenzo, Veraguas, *Seemann;* Panama (Herb. Fac. Sci. Monspel.).

COSTA RICA: Upper forests at El Rodeo de Pacaca, alt. about 1,000 meters, *Pittier*, male flowers only, December, 1892 (Instituto fís. geog. Costa Rica, no. 1634).

GUATEMALA: Teocinte (Sta. Rosa) alt. about 830 meters, *Heyde & Lux*, male flowers only, December, 1892 (Donnell Smith distribution, no. 4315).

It is by no means certain that the tree met with in Costa Rica and Guatemala represents the species described first by Seemann from San Lorenzo de Chiriqui. If this proves to be really the case, then Seemann's description will be shown to be very inaccurate.

**Rheedia magnifolia** Pittier, sp. nov.

A forest tree 15 to 20 meters high. Trunk 35 to 40 cm. in diameter. Crown elongate. Floriferous branchlets thick, laterally compressed, longitudinally striate-grooved when dry.

Leaves very large, thick and coriaceous. Petiole thick, 1.5 to 2 cm. long, with a broad, bulging foveola on the axillary side of the base. Leaf blade ovate-elliptic, rounded at base, shortly acuminate at tip, 35 to 40 cm. long, 15 to 20 cm. broad, dark green above, brownish-glaucous and finely puncticulate beneath. Main nerve very prominent and with an acute edge on the lower side, the lateral ones parallel, anastomosed transversely, 6 to 12 mm. distant, all merging into a marginal vein.

Male flowers in fascicles of 2 or 3 (?) in the axils of fallen leaves. Pedicels 3 cm. long. Sepals 2, ovate-rounded, 5 mm. broad and long, connate. Petals 4, ovate, narrowing at base into a short claw, rounded at tip, 11 to 12 mm. long, 7 to 10 mm. broad, pale yellow. Stamens numerous (about 30), inserted at the base of a central disk; filaments rather thick, nearly 4 mm. long, anthers small (about 0.5 mm. long and broad), basifix. Disk about 4.5 mm. in diameter, hemispherical with a muriculate surface. Female flowers not known.

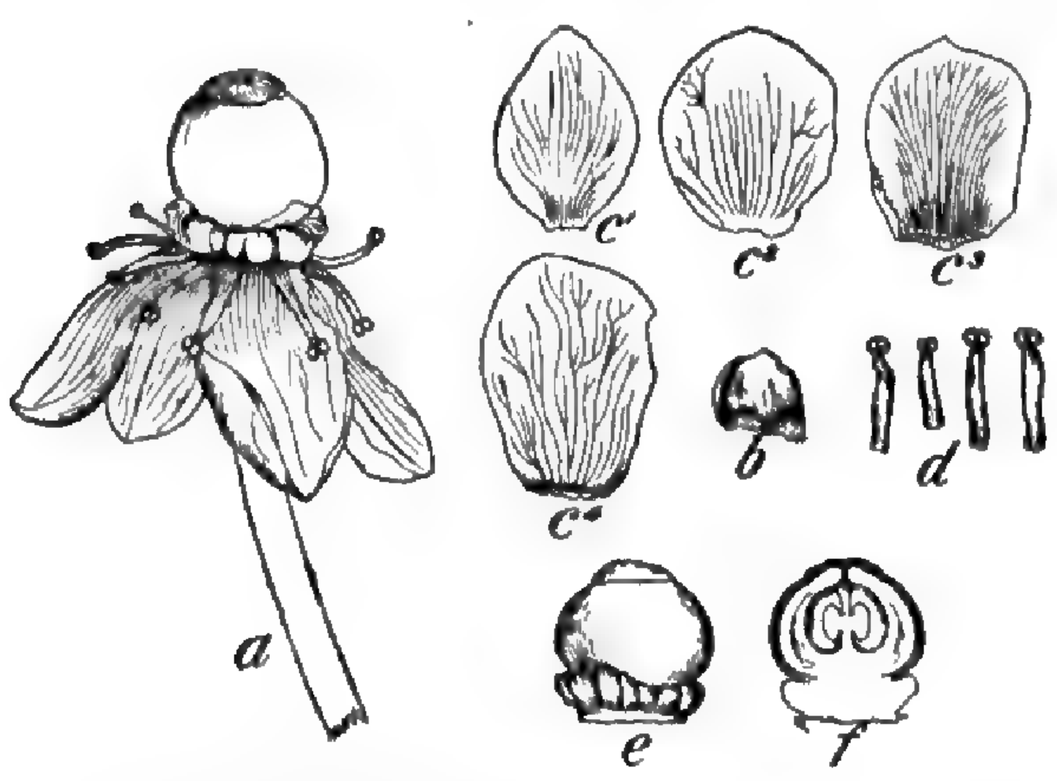



FIG. 81.—*Rheedia intermedia*, flower and details. *a*, Hermaphrodite or female flower; *b*, sepal; $c^1$ and $c^2$ the exterior, $c^3$ and $c^4$ the interior petals; *d*, stamens; *e*, ovary and disk; *f*, vertical section of same. Scale 3.

"Fruits ovoid, about 6 cm. long and 4.5 cm. in diameter, with a smooth, yellow skin. Seeds large, surrounded by an acidulous sweet pulp, edible and quite palatable" (MS. notes).

Type in the U. S. National Herbarium, no. 578033, collected in forests above Rio Hondo near Matina at an altitude of 400 meters, August, 1901, by H. Pittier. Male flowers and fruits only. Same in Instituto fís. geog. Costa Rica, no. 16165.

This species differs from any of the group Eurheedia by its enormous leaves, much larger and broader than in *R. macrophylla*, and broader than in *R. longifolia*, and also by the size of its male flowers, the few-flowered inflorescences, and the dimensions of the fruits. On account of its fruit, the taste of which is agreeable and refreshing, this species is indicated for cultivation and improvement in warm, humid climates.

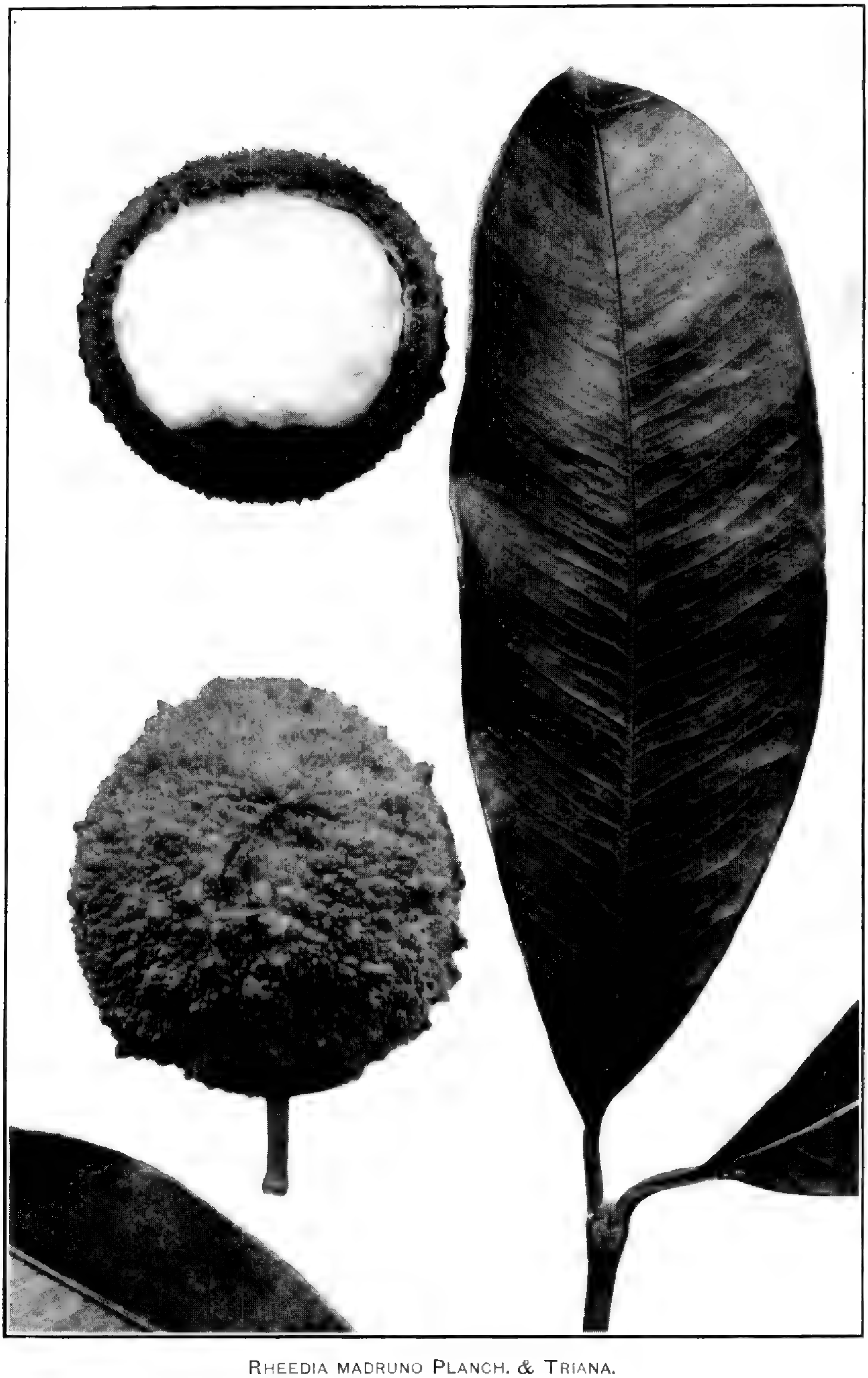
**Rheedia intermedia** Pittier, sp. nov. FIGURE 81.

A tree. Branchlets subterete or depressed. Internodes 3 to 11 cm. long.

Leaves rather large, when newly spread of a deep reddish color. Petioles about 2 cm. long, rather thick, broadly canaliculate above and with an acute edge below. Leaf blades elliptic-acuminate, cuneate-rounded at base, 15 to 23 cm. long, 5 to 7 cm. broad; main nerve prominent on both faces and with a sharp edge beneath; primary veins



RHEEDIA MADRUNO PLANCH. & TRIANA.



RHEEDIA MADRUNO PLANCH. & TRIANA.

numerous, more or less parallel, simple or ramified and profusely anastomosed, the principal ones merging into a marginal nerve.

Flowers in fascicles of 1 to 5 in the axils of deciduous leaves. Female flowers: Pedicels slender, 1 to 2 cm. long; sepals 2, conchoid, rounded with a more or less distinct apex, 1.2 mm. long, 1.5 mm. broad; petals more or less ovate-rounded, often with an acute tip, 3.5 to 4 mm. long, 2.5 to 3 mm. broad; staminodes about 10 (?), deciduous, 1.5 to 2 mm. long, with minute rudimentary anthers; disk lobulate, about 2.5 mm. in diameter and 0.6 mm. high; ovary globose-depressed, about 2.5 mm. in diameter and 2 mm. high, bilocular by abortion and each cell with one ovule; stigma sessile, peltate, with smooth edge, about 1.5 mm. in diameter and 0.2 mm. high. Male flowers and fruit not known.

Type in the U. S. National Herbarium, no. 398468, collected upon Rio Lanquín (Alta Verapaz), Guatemala, at an altitude of about 400 meters by von Türckheim, female flowers only, March, 1902 (Donnell Smith distribution no. 8180).

Also collected around Sepacuité (Alta Verapaz), at about 1,000 meters altitude, *Cook & Griggs* 477, leaves only, April 5, 1902 (U. S. National Herbarium, no. 408188).

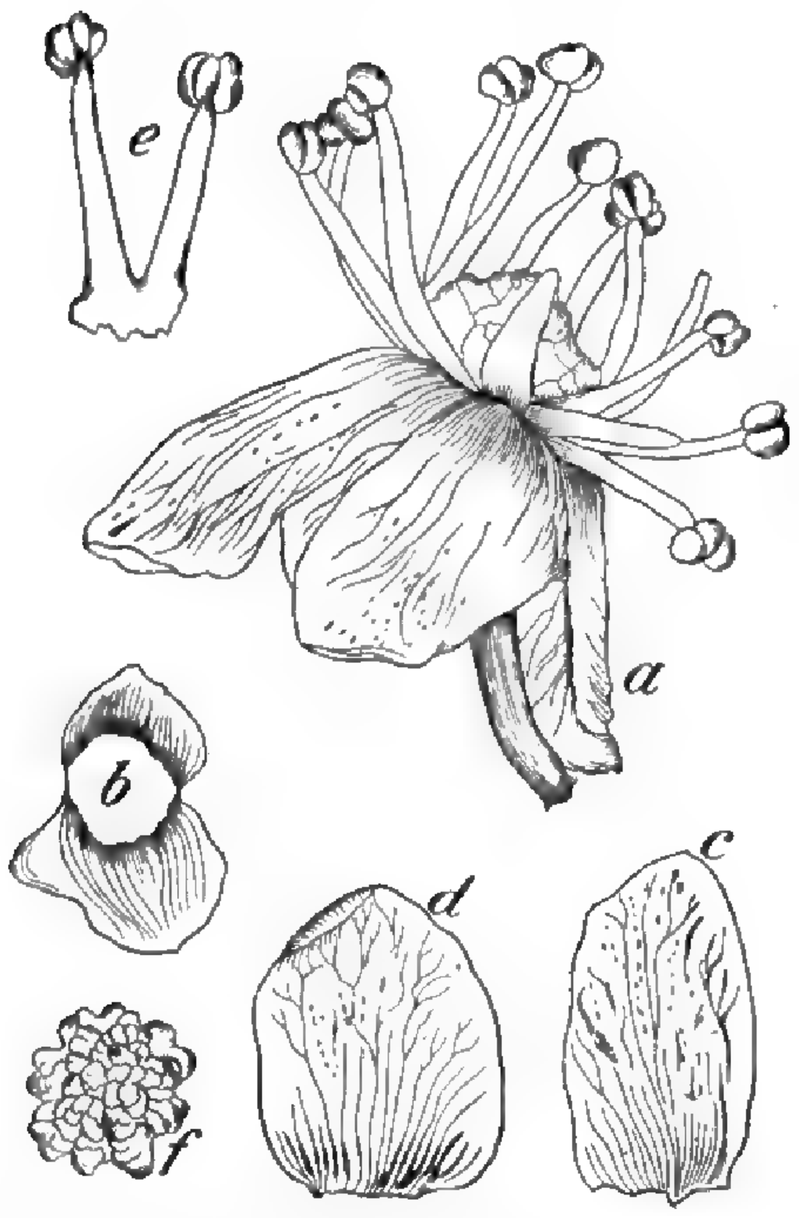



FIG. 82.—*Rheedia madruno*, male flower and details. *a*, Male flower; *b*, calyx; *c*, exterior petal; *d*, interior petal; *e*, stamens; *f*, disk seen from above. Scale 3.

This species differs from *R. macrophylla* Planch. & Triana var. *benthamiana* Vesque, under which name it has been distributed, in several particulars. Its flowers are about half smaller and the staminodes apparently less numerous; the stigma is narrower, not quite covering the globose-depressed ovary; the disk is not so pronounced. In the petioles the canal is almost closed by the reflexed wings and the foveola is more elongate. This tree is now made known under its new name with the concurrence of Capt. John Donnell Smith, who kindly furnished the best materials of his rich herbarium to make possible a satisfactory description.

**Rheedia madruno** Planch. & Triana, Ann. Sci. Nat. IV. **14**: 315. 1860.

PLATES 92, 93. FIGURE 82.

A tree 6 to 8 meters high, with a low, pyramidal or subspherical, densely leafy crown Branchlets subtetragonous and sulcate (when dry).

Leaves rather variable in size and form. Petioles 1 to 1.4 cm. long, canaliculate, subtetragonous, mostly of a light yellow color in young specimens; foveola about 4 mm. long, not very prominent. Leaf blades elliptic or oblong, cuneate at base, rounded, acute, or acuminate at tip, 6 to 15 cm. long, 2 to 5 cm. broad, dark green above, paler beneath; main nerve and primary veins prominent on both faces, the former rounded above and below, the latter numerous (about 60 on each side), single or bifurcate, more or less parallel, closely anastomosed and merging into a thick marginal vein.

Flowers more or less numerous (up to 14) in the axils of the leaves (these mostly absent at flowering time) on the former year's growth. Male flowers: Pedicels 12 to 20 mm. long, slender; sepals 2, ovate-rounded or crescent-shaped, 1 to 2 mm. long, 2 to 3 mm. broad, reflexed; petals 4, reflexed, pale yellow, the exterior ones ovate-elongate, about 7 mm. long, 3 to 3.5 mm. broad, more or less regularly rounded at tip, the interior ones ovate to ovate-rounded, 5.5 to 6 mm. long, 3.5 to 4.5 mm. broad, rounded at tip, all obscurely veined and irregularly dark-striate or dotted; stamens 25 to 30, biseriate, very shortly adnate at base and of a light yellow color; filaments

rather slender, their free part 3 to 4 mm. long; anthers rounded, their cells distinctly bilobate; disk conical, muricate, about 3 mm. in diameter and 2.3 mm. high. Female flowers not known.

Fruit globose, about 5 cm. in diameter; skin verrucose, thick, lime-yellow outside, exuding when sectioned a sulphur-yellow, resinous latex. Seeds 1 to 3, ovate, about 2 cm. long, wrapped in a white, mellow, sweetish-acidulate, edible pulp.

COLOMBIA; La Manuelita near Palmira, eastern side of Cauca Valley, alt. about 1,200 meters; male flowers and fruits, December 30, 1905, *Pittier* 843.

EXPLANATION OF PLATES 92, 93.—Pl. 92, tree; pl. 93, fruits, one opened, and twig with terminal bud and leaves. From photographs taken in the field by Pittier & Doyle. Pl. 93, natural size.

**Rheedia madruno ovata** Pittier, subsp. nov. PLATE 94.

Leaves mostly obovate-elliptic, long-cuneate at base, shortly acuminate or rounded at tip; petioles longer than in type. Flowers unknown. Fruit ovoid or conical at both ends, 6 cm. long, 4.5 cm. in diameter, with a long (2.5 cm.) pedicel. Seeds 3 cm. long.

Type in the U. S. National Herbarium, no. 531108, collected at La Manuelita near Palmira, eastern side of Cauca Valley, Colombia, altitude 1,100 to 1,302 meters in 1905–1906, by H. Pittier (no. 916). The type sheet shows only leafy stems. A second sheet bears 3 photographs, one of them here reproduced.

EXPLANATION OF PLATE 94.—Twig with leaves, a fruit, another fruit dissected, and a seed. Photograph by Pittier & Doyle.

**Rheedia madruno bituberculata** Pittier, subsp. nov. PLATE 95.

Fruits found on the market at Cali (Cauca, Colombia). They have a basal and an apical nipple and are 7 cm. long and 5.5 cm. in diameter. The seeds are much longer (4 cm.) than in the foregoing varieties.

Type represented by a photograph in the U. S. National Herbarium, showing 4 fruits, 2 of them dissected.

EXPLANATION OF PLATE 95.—From the type photograph by Pittier & Doyle.

In view of the several deficiencies in the descriptions of the Andean species of Rheedia, I deem it preferable, notwithstanding the opinion of Vesque, to retain for the present the specific division established by Planchon and Triana in the memoir cited above. The identity of *Rheedia acuminata* and *R. madruno* of these authors is by no means elucidated by Vesque's explanations, and the diversity in the shape and dimensions of the fruits, as observed by me in the Cauca Valley, points to the coexistence there of several species of the group Verticillaria.

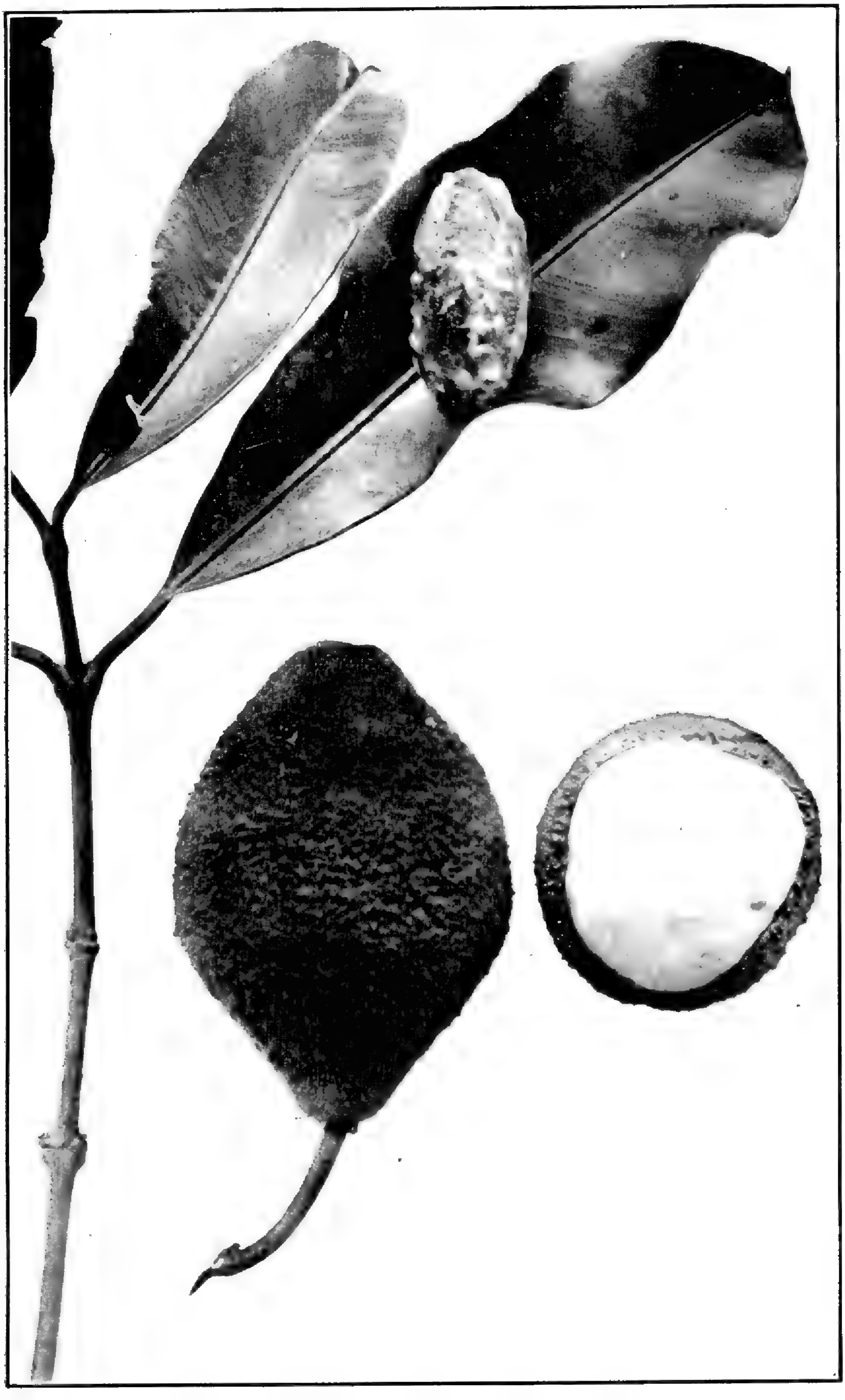
The *madroños* of the Cauca Valley are during their season a staple article of consumption among all classes, and are brought to the markets in large quantities. Their taste is rather agreeable, but, on account of the pulp firmly adhering to the large seeds, they feel rather awkward to the mouth.

**Symphonia globulifera** L. f. Suppl. Pl. 302. 1781.

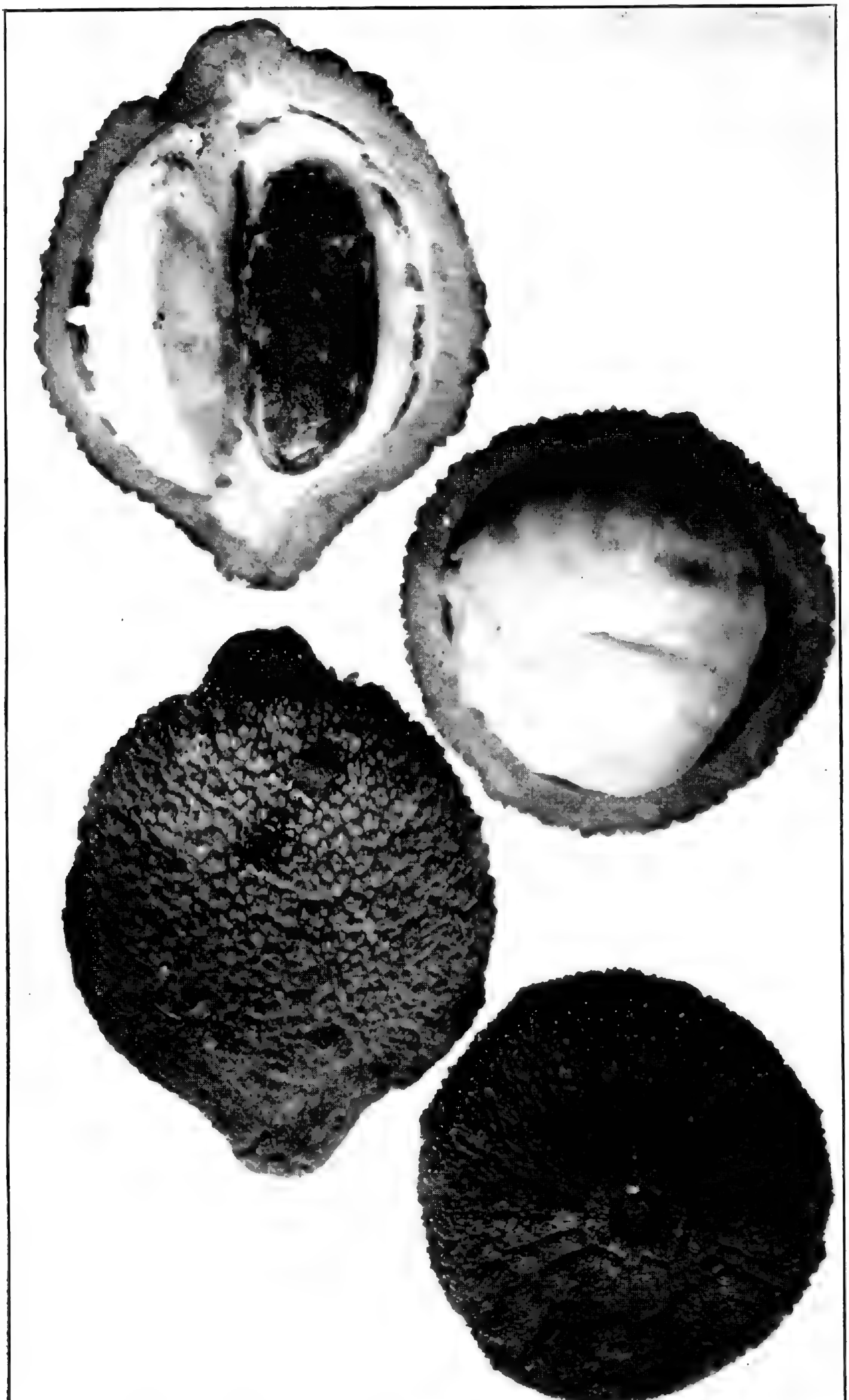
Vesque[a] notes that he has not been able to observe a single fruit of this tree, apparently widely spread in the *tierra caliente* of tropical America and well represented in most herbaria. He adds that Planchon and Triana have attributed to that species a hairy seed, an assertion that is contradicted both by the testimony of the original description of Linnæus the son and by that of Bentham and Hooker.[b] I have had several opportunities of studying this Symphonia in the forests of Costa Rica, where the Indians call it *cerillo* and tap it for the waxlike resin, which they use for lighting purposes. The fruits, as recorded in my notebooks, are ovate or ovoid-acuminate, 1.5 to 2 cm. long, 1 to 1.2 cm. in diameter, with a brown skin and a thin mesocarp filled with laticiferous ducts; they bear at the tip the persistent stigmas and the remnants of the stamens, and are almost without exception monospermous

[a] In DC. Monogr. Phan. **8**: 228.

[b] Gen. Pl. **1**: 173.



RHEEDIA MADRUNO OVATA PITTIER.



RHEEDIA MADRUNO BITUBERCULATA PITTIER.

by abortion. The seeds are ovoid-oblong, subtrigonous, 12 to 15 mm. long, about 8 mm. in diameter, covered by an arilluslike tegument, and always perfectly glabrous.

## SAPOTACEAE.

### AN OLD AND A NEW SPECIES OF LUCUMA.

**Lucuma obovata** H. B. K. Nov. Gen. & Sp. **3**: 241. 1818. FIGURE 83.

*Achras lucuma* Ruiz & Pav. Fl. Peruv. Chil. **3**: 17. *pl. 239*. 1802; Molina, Sagg. Stor. Nat. Chil. ed. 2. 282. 1802.

A tree 8 to 10 meters high, laticiferous, evergreen and with a very dense, rounded or subglobose crown. Limbs spreading, with rugose, grayish bark. Branchlets terete, minutely pubescent.

Leaves in bunches at the ends of the branchlets. Petioles 12 to 22 mm. long, broadly flattened and sulcate above, rounded beneath, subglabrous. Leaf blades 11 to 12 cm. long, 4 to 5 cm. broad, elliptic-ovate, acute at the base, rounded or subacute at the tip, membranous or subcoriaceous, entire with a revolute margin, glabrous, dark green above, paler or ferruginous beneath; primary veins bifurcate, reticulate-anastomosed.

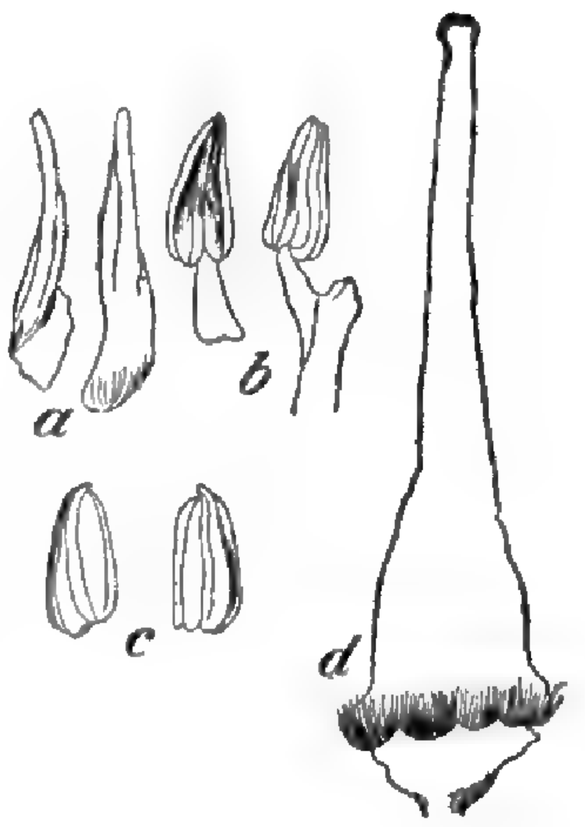



FIG. 83.—*Lucuma obovata*, floral details. *a*, Staminodes; *b*, stamens; *c*, anthers; *d*, pistil. Scale 3.

Flowers 1 to 3 in the axils of the leaves. Pedicels 10 to 12 mm. long, subglabrous. Sepals 5, 9 to 10 mm. long, 7 to 9 mm. broad, free, ovate, obtuse, concave, coriaceous, hairy-tomentose on the back, imbricate, the two exterior ones opposite and covering the others. Corolla 5-lobed (sometimes 6 or 7), about 13 mm. long; lobes about 6 mm. long, 4 mm. broad, ovate-orbicular, rounded at tip, subauriculate at the base on the right margin, minutely hairy or papillose on the outside. Staminodes 3.5 to 4 mm. long, sublinear, nude at the apex, subtrigonous and papillose for the lower part. Stamens very short (about 4 mm. long), glabrous, the filament rather short and stout, subulate; anthers almost basifix, ovoid-acuminate, apiculate. Pistil of variable length, according to the stage of anthesis, glabrous with a crown of stiff hairs around the base; ovary ovoid, 5-celled; style erect, obscurely sulcate and slightly capitellate.

Fruit globose-depressed or sometimes ovate, as large as a good-sized apple, green and smooth outside, bearing at the base the persistent calyx and at the apex a squamose or rugose spot or ring; sarcocarp thick, yellow, mealy. Seeds 1 to 5, but most commonly 2, subglobose, flattened on the umbilical surface, of the size of a chestnut.

COMMON NAMES: Kitšua, *lucmo*, or *lucumo* (Chile, Peru); Spanish, *mamón* (Costa Rica).

This tree appears to be a native of the maritime provinces of Peru and Chile, but Ruiz and Pavon seem to have known it only in the cultivated condition, while Bonpland simply states that it grows in the temperate region in the neighborhood of the town of Loja.[a] In Costa Rica it exists only in a few specimens in gardens around San Jose and is said to have been introduced there by returning political exiles during the first half of the past century.

It flowers and fructifies all the year round. According to Ruiz and Pavon the fruits are not quite edible when they drop from the tree, and the natives of Peru

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[a] Velasco evidently refers to this species when he says: "El arbol es bastante grande, y tambien el fruto redondo, con diámetro de cinco dedos mas ó menos. Es carnoso, arenoso, poco dulce y seco, de corteza pajiza, carne amarilla y pepita grande, redonda muy lustrosa." Historia del Reino de Quito, p. 62, pl. 1. 1844.

keep them for a time in stored grain, chaff, furs, or dry hay until sufficiently soft. The mesocarp looks then quite like the yolk of a hard-boiled egg; it is sweet and agreeable at first, but soon becomes somewhat repugnant on account of a peculiar fatty taste, due to the latex that impregnates it.

The wood is whitish, compact, and durable; it is used by the Peruvians, according to the same authors, as a building material, which seems to indicate that the occurrence of the tree is not limited to gardens and orchards.

**Lucuma jenmanii** Pittier, sp. nov.

A tree. Branchlets thick, glabrous. Internodes very short. Terminal buds and new growth more or less hairy-tomentose.

Leaves rather large and long-petiolate. Petioles 3 to 5 cm. long, terete, canaliculate, hairy or glabrescent. Leaf blades 20 to 30 cm. long, 7 to 9 cm. broad, obovate, cuneate-rounded at base, rounded, obtuse or shortly acuminate at tip, glabrous and almost shiny above, with the costa impressed and the primary veins slightly prominent, glabrous, opaque, with both costa and veins quite prominent and the intervenal spaces finely reticulate beneath; margin entire, slightly revolute; primary veins about 20 on each side.

Flowers sessile, in clusters of 2 to 5 (?) in the defoliate axils of the former season's growth, or in the axils of the upper leaves, and completely covering the branchlets. Basal bractlets very small, ovate, ferruginose-tomentose. Sepals 4, imbricate, free or more or less adnate at the base, 8 to 11 mm. long and broad, broad or slightly attenuate at the base, rounded or obtusely acuminate at the tip, coriaceous and more or less scarious on the margin, silky hairy outside. Corolla broadly tubular, about 14 mm. long, 4-lobate, glabrous or subglabrous, ciliate on the margin of the lobes; tube about 10 mm. long; lobes short (3 mm. long, 4 mm. broad), broadly ovate-rounded, slightly contracted at the base. Staminodes alternating with the lobes of the corolla, about 2 mm. long, ovate-lanceolate and abruptly contracted into a rounded, papillose point; margin of the lower part of the staminode sometimes sparsely provided with stiff, erect hairs. Stamens glabrous; filaments about 9 mm. long, but adnate to the corolla for two-thirds of their length; anthers elongate-elliptic, 22 mm. long. Pistil 13 to 14 mm. long; ovary depressed-globose, 4-celled, densely covered with stiff gray hairs; style about 11 mm. long, glabrous, divided at the tip into 2 lobes, each of these again obscurely bilobulate.

Fruit not known.

Type in the U. S. National Herbarium, no. 619294, collected at Demerara, British Guiana, by Jenman (no. 4107).

## NOTES ON SPECIES OF SIDEROXYLON.

The genus Sideroxylon was established by Dillenius, the type, *S. inerme* L., being a tree of the Cape Colony in South Africa.[a] The first generic definition given by Linnæus in his Genera[b] was correct as to the corolla and the staminodes, but erroneously gave the fruit as 4-seeded, a mistake that was apparently soon discovered, since it is not repeated in the 1748 edition of the Systema. Time after time unfortunate additions increased the genus and caused the original definition to be repeatedly altered. These additions not only included several Bumelias and a few other species belonging to closely related genera of the Sapotaceae, but also a Scleroxylon

[a] Dill. Hort. Elth. **2**: 357. 1732.

[b] Gen. Pl. no. 264. 1737.

(Celastraceae), a Myrsine, and an Olinia (Oliniaceae). They furnish a ready explanation of the repeated changes just referred to.

The inconsistency of the successive editions of Linnæus's Systema and Genera and of the Mantissae, with reference to the genus Sideroxylon, was first brought to light by Jacquin,[a] who, in 1788, made an attempt to remedy the existing confusion of species, confessing, however, that any effort to get a clear understanding of the characters of the genus would be vain as long as the structural details of the fruit were not fully known. Jacquin himself had published in 1760[b] three species of American Sideroxylon, viz, *S. sapota*, *S. foetidissimum*, and *S. pauciflorum*. In the Stirpium Americanarum Historia[c] the first species is referred to "Achras (Zapota major)" (*Lucuma mammosa* Gaertn.), without mention of the former name, and it was left thus disposed of. The two other species are described at length, but without emphasizing to any extent the differential characters given in the Enumeratio. According to this, *S. foetidissimum* has subopposite, *S. pauciflorum* alternate leaves. Besides, in *S. pauciflorum* the leaves are said to be always obtuse, the floral glomerules fewer flowered, the flowers less ill-smelling, and the tube of the corolla shorter. As a matter of fact, the examination of many specimens shows that the mature leaves are always alternate and the remaining characters very variable, so that we can but participate in the doubts of Jacquin and finally accept the more modern view of Urban,[d] who reunites the two species under the first name.

Urban, however, seems to have carried his amalgamating process too far, and in the specimens of the U. S. National Herbarium representing numbers enumerated by him[e] under the name of *S. foetidissimum*, we find no less than three forms or types, which can be readily distinguished even though our specimens are not quite satisfactory. Their distinctive characters are recapitulated in the following table:

Floral pedicels 10 mm. long. Anthers elongate-elliptic. Upper end of the connective spoon-shaped and slightly surpassing the apex of the cells. Seeds (pl. 96, *a*) broadly obovoid and flattened or sulcate at the apex; umbilical area circular; glabella prominent but not biscutellate. Leaves long-petiolate, ovate-elliptic, attenuate at the base, not coriaceous.—Cuba (*Wright* 1324).

Floral pedicels 5 to 6 mm. long. Anthers ovate.

Floral pedicels pubescent. Corolla 6 to 6.5 mm. long. Anthers not apiculate. Staminodes equal to fully half the length of the lobes of the corolla. Seeds ovoid-oblong (pl. 96, *b*); umbilical area ovate; glabella replaced by a small depression. Leaves rather short-petiolate, ovate, coriaceous, rounded at the base and forming a small pouch or fistula.—La Guadeloupe (*Duss* 2915).

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[a] Coll. Bot. **2**: 247. 1788.

[b] Enum. Pl. Carib. 15. 1760.

[c] Page 56. 1763.

[d] Symb. Antill. **5**: 131. 1904.

[e] Loc. cit. 133.

Pedicels glabrous. Corolla 3.5 to 4 mm. long. Anthers slightly apiculate. Staminodes hardly above 1 mm. long. Seeds ovoid (pl. 96, *c*); umbilical area circular; glabella distinctly biscutellate. Leaves long-petiolate, pouchless.—Porto Rico (*Sintenis* 5001, 3950; *Heller* 507); Florida (*Garber; Chapman* 11, *Curtiss* 1759).

On account of the incomplete descriptions of the older authors, it is difficult to identify these forms with their intended specific names. It is, however, safe to admit that the Porto Rico and Florida specimens represent the original *S. mastichodendron* of Jacquin and Gaertner (fig. 84), even though Jacquin does not mention the characteristic "glabella ovata bipartita" which seems to be a constant feature of the seeds in the Porto Rican and Floridan specimens and which is clearly shown in plate 202 of the Supplementum Carpologiae[a] of the last author. An obscure detail of this question is that the origin of the specimen made use of in Gaertner's description is not given, while the names *acouma jaune* ou *abricot des bois* would seem to indicate a product of the French West Indies.

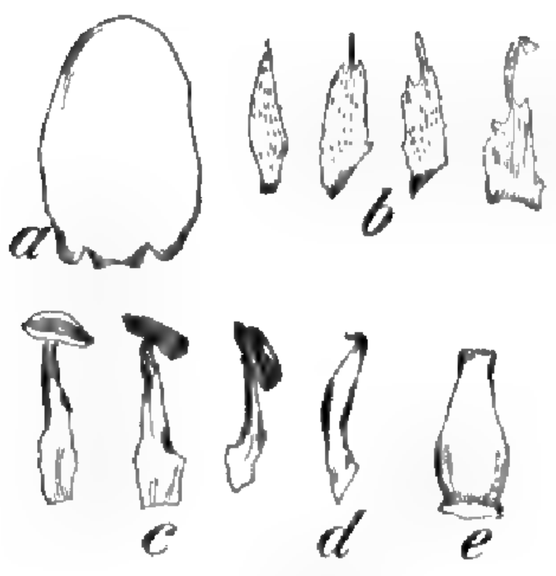



FIG. 84.—*Sideroxylon mastichodendron*, floral details. *a*, Petal (auriculate); *b*, staminodes; *c*, stamens; *d*, filament; *e*, pistil. Scale 3.

The other forms may represent entirely new species, or correspond to some of the older ones (*S. obovatum* Gaertn., *S. acouma* A. DC., *S. foetidissimum* Jacq.) (fig. 85). In regard to their status, we may repeat here what Jacquin said with respect to the whole genus: "Donec omnium fructificatio plene cognita sit, frustra tentabimus." Only the careful comparison of large series of complete materials will enable us to decide, and meanwhile Urban's step in condensing forms a few of which are to all appearances specifically characterized must be considered as premature.

The presence of a Sideroxylon of the *mastichodendron* group on the continental part of Central America is indicated by a specimen collected by Gaumer (no. 763) near Izamal (Yucatan). It was identified by Dr. Millspaugh[b] as the true *S. mastichodendron*, but is certainly quite distinct from the specimens quoted above from Florida and Porto Rico, as well as from the Cuban tree, specimens of which were collected by Wright. I now propose to name it *Sideroxylon gaumeri*, its description being given below.

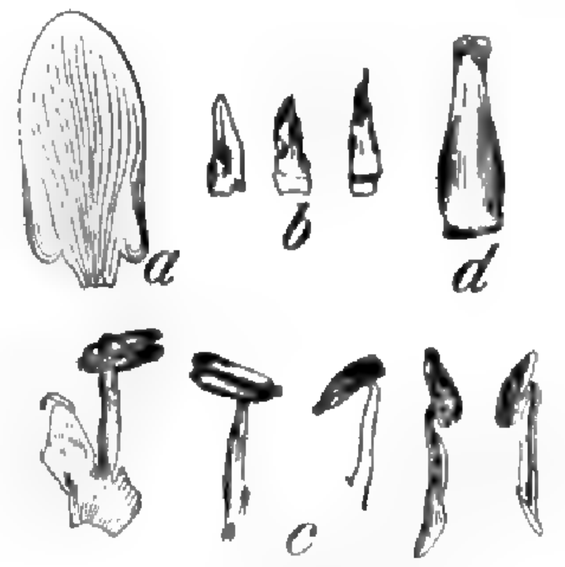



FIG. 85.—*Sideroxylon foetidissimum* (?), floral details. *a*, Petal; *b*, staminodes; *c*, stamens; *d*, pistil. From Wright's No. 1324 (Cuba). Scale 3.

Under the much-used name of *Sideroxylon mastichodendron* Jacq., several collectors have distributed another Central American representative of the genus, widely known among the natives as *tempisque* or *tempixque*. It will be conclusively shown that this is in reality a very distinct type, more closely related to a Mexican species with many names, *Sideroxylon capiri*, which is also described and discussed in this paper.

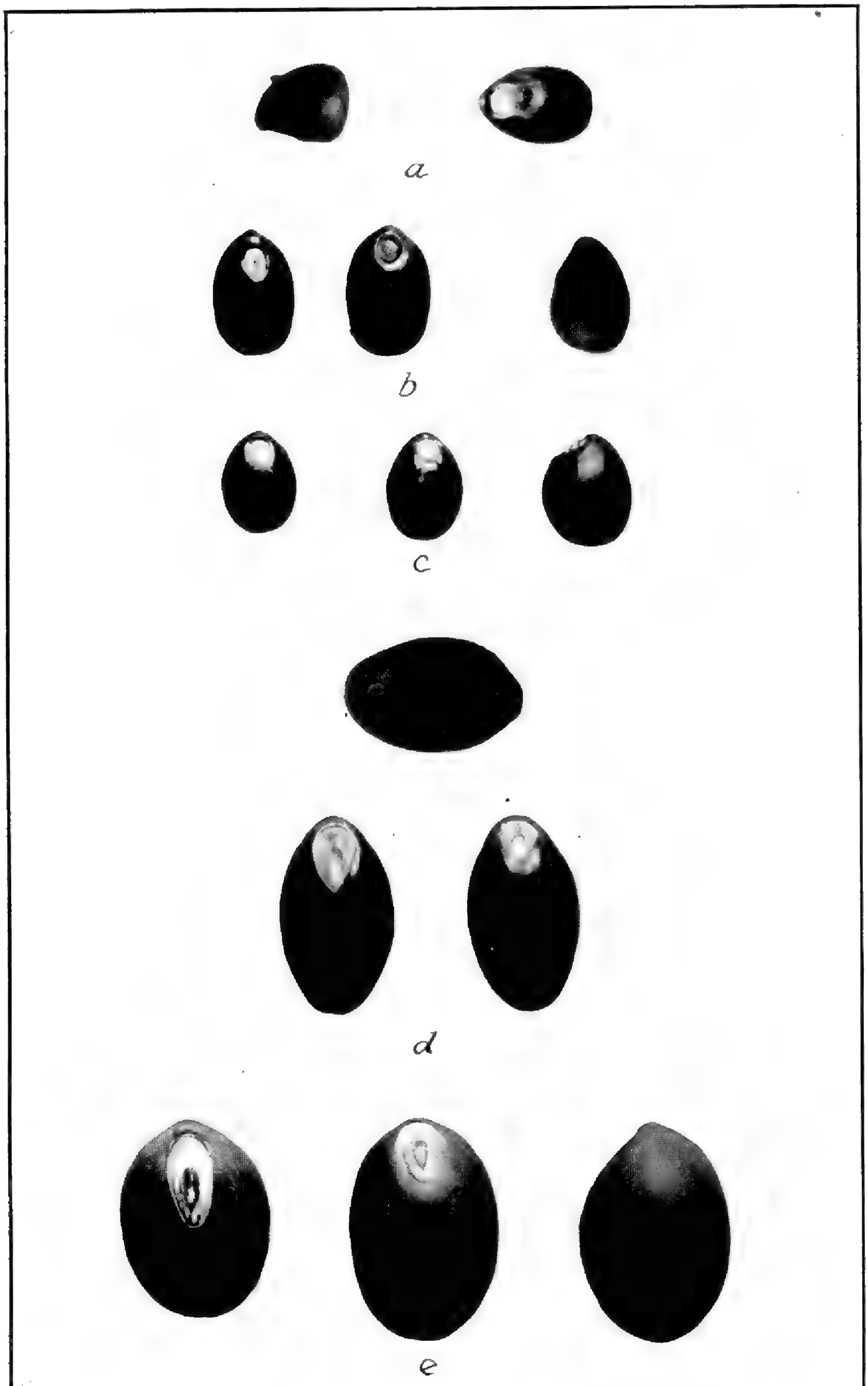
EXPLANATION OF PLATE 96.—Seeds of Sideroxylon. *a*, Cuba, *Wright* 1324; *b*, Guadaloupe, *Duss* 2915; *c*, Florida, *Curtiss* 1759—these representing three forms included by Urban under *S. foetidissimum; d*, *Sideroxylon capiri; e*, *Sideroxylon tempisque*. From photographs taken in Washington by Pittier & Doyle. All natural size.

**Sideroxylon gaumeri** Pittier, sp. nov. FIGURE 86.

A tree 25 to 30 meters high. Branchlets rather thick, with a glabrous iron-gray bark. Younger growth glabrous.

Leaves crowded at the end of the branchlets, glabrous, petiolate. Petioles 3.5 to 4 cm. long, slender, obscurely sulcate above. Leaf blades coriaceous, 8 to 10 cm. long, 3 to 5.5 cm. broad, ovate, rounded and shortly decurrent at base, rounded

[a] Gaert. f. Fruct. & Sem. **3**: 123. *pl. 202*. 1805–1807. [b] Field Mus. Bot. **1**: 313. 1896.




SEEDS OF SIDEROXYLON SPP.

and sometimes emarginate at tip, finely reticulate; main nerve impressed above, prominent beneath; veins salient on both faces; margin undulate.

Flowers pedicellate, in glomerules of 18 or less, entirely glabrous. Pedicels 4 to 5 mm. long. Calyx about 1.5 mm. long; sepals suborbicular, shorter than broad. Corolla pale yellow, 3.5 to 4 mm. long, 5-lobate; tube about 0.6 mm. long; lobes ovate, obtuse, not auriculate. Staminodes ovate-acuminate, 1.4 to 1.7 mm. long, with one or two subulate points, irregularly denticulate on the margin, longitudinally dotted-striate. Stamens short (1.8 to 2 mm. long); filaments thick and straight, bent and subulate at tip; anthers ovate (1.6 to 1.8 mm. long) with the connective cleft at the base and emarginate or shorter than the cells at the tip. Pistil glabrous, about 2.3 mm. long at the time of anthesis, deeply 5-sulcate; ovary ovate, 5-celled; style short, obtuse.

Fruit and seed unknown.

Type in the U. S. National Herbarium, no. 268389, collected at Izamal, Yucatan, July, 1895, by G. F. Gaumer (no. 763). Tree 80 feet high, very rare, only one seen; flowers.

This species is a near relative of the forms with ovate anthers of the West Indies and Florida, but differs from them by its many-flowered clusters, the inauriculate lobes of its corollas, its emarginate connectives, its distinctly 5-sulcate pistils, and probably by the characters of the fruit and seed.

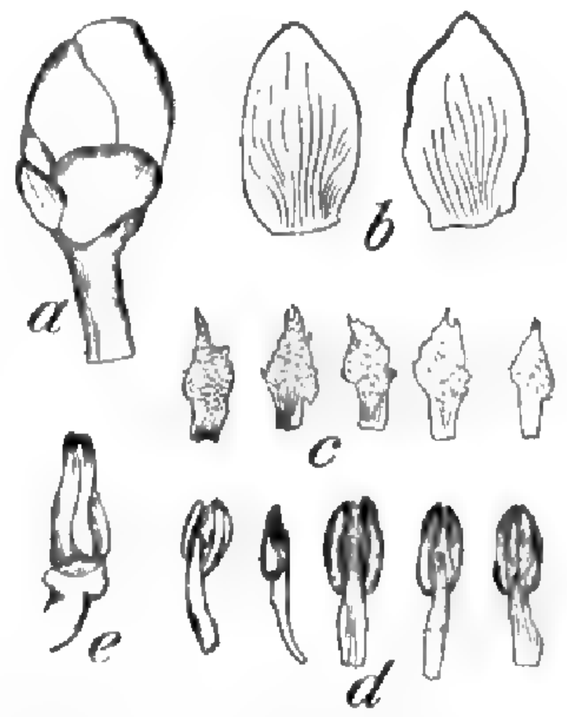



FIG. 86.—*Sideroxylon gaumeri*, flower bud and floral details. *a*, Bud; *b*, petals (not auriculate); *c*, staminodes; *d*, stamens; *e*, pistil. Scale 3.

**Sideroxylon tempisque** Pittier, sp. nov. PLATE 96, *e*. FIGURES 87, 88.

A large tree. Branchlets more or less thick, with a dark gray bark, covered with the verrucose scars of the fallen leaves.

Leaves irregularly alternate, long-petiolate, glabrous, crowded at the ends of the branchlets. Petioles 4 to 8 cm. long, canaliculate above, rounded on the lower face, thicker and broader at the base. Leaf blades 7 to 12 cm. long, 3 to 5 cm. broad, elliptic-ovate, subacute at tip, finely reticulate, wavy on the margin, extended at the base over the petiole and forming a pouchlike, conical appendage, this bearing almost always a single minute spine on the upper margin; main nerve canaliculate above, prominent below; primary veins slightly prominent on both faces.




FIG. 87.—*Sideroxylon tempisque*, floral details. *a*, Part of corolla, showing lobe, staminode, and stamen; *b*, stamen, with base of corolla lobe and staminode; *c*, upper part of filament; *d*, frontal view of anther; *e*, pistil; *f*, section across ovary. Scale 3,

Flowers pedicellate, yellowish white, in clusters of 10 or less in the defoliate axils nearest to the ends of the branchlets. Pedicels about 5 mm. long, glabrous. Calyx about 3 mm. long, with 5 rounded ovate sepals, pubescent outside, slightly adnate at the base, persistent. Corolla 7 to 8 mm. long, 5-lobate, puberulous, glabrescent outside; tube very short (not over 1.5 mm. long); lobes imbricate, elliptic-ovate, 6 to 7 mm. long, slightly concave, auriculate or subauriculate at the base, rounded at the apex. Staminodes rudimentary (about 0.8 mm. long, ovate-squamiform, more or less acute at tip. Stamens nearly as long as the lobes of the corolla, extrorse, glabrous; filaments slender, rounded, 4 mm. long, subulate and incurved at tip; anthers 3.5 to 4 mm. long, extrorse, mediofix, ovate-acuminate, deeply cleft at the base, obtuse at tip. Pistil about 5 mm. long at time of anthesis, claviform, minutely hairy; ovary elongate-ovoid, 5-celled; style thick, obtuse.

Fruit pedunculate, ovoid, acuminate, 3 to 4 cm. long, 2 to 2.5 cm. in diameter, apiculate, smooth; peduncles 1 to 1.5 cm. long, thick, stiff. Seed 1, ovoid, 2.3 to 2.8 cm. long, 1.5 to 1.8 cm. in diameter, brown, smooth but not glossy; umbilical area ovate-elliptic, whitish, bordered with a deeper groove, the hylum brownish, ovate, isolated toward the lower end of the area.

Type in the U. S. National Herbarium, no. 578318, collected at La Laguna de Santa Tecla, Salvador, altitude about 800 meters, in flower, February 6, 1907, by H. Pittier (no. 1917). A medium-sized tree.

SALVADOR: Type specimen.

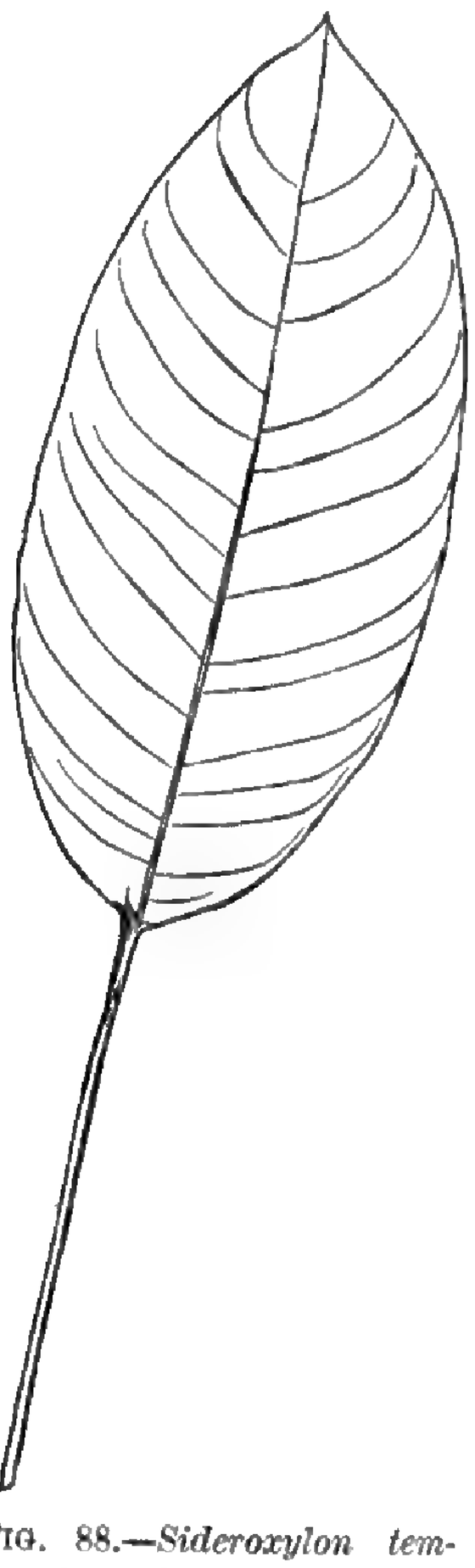


FIG. 88.—*Sideroxylon tempisque*, leaf. Scale ¼.

GUATEMALA: Amatitlan, alt. 1,300 meters, *Donnell Smith* 2508, flowers, May, 1892; Gualán (Zacapa), 122 meters above sea level, *Kellerman* 5023, fruit (U. S. Nat. Herb. no. 578624); between Nenton and Candelaria (Huehuetenango), *Cook* 62, flowers, June 1, 1906 (Nat. Herb. no. 574416); around La Antigua (Zacatepequez), alt. 1,480 meters, *Cook*, 1905, fruits in market (Nat. Herb. Seed Coll. no. 2713).

Spanish: *Tempisque* (Guatemala, Salvador. The name originally belonged to one of the dialects of Oaxaca or southern Mexico). Nahuatl: *Saquaia* (Nahuizalco, Salvador). Kakchiquel: *kobak* (Guatemala).

This species is quite distinct from *S. mastichodendron* Jacq., a native from the Bahama Islands, Porto Rico, and Florida, with which it has been repeatedly confused. The petioles of the leaves are on the average much longer, the flowers much larger, the staminodes far from reaching half the length of the lobes of the corolla and not subulate nor acute, but rounded-squamose. The fruits and seeds are also about three times as large, the former acuminate and not rounded at tip. A special character that is wanting in *S. mastichodendron*, although it is mentioned by Urban,[a] is the conical fistule or pouch at the base of the lamina. In Donnell Smith's specimens a small spine is always present at the mouth of the pouch on either side of the main nerve; in the other specimens it is mostly lacking, but the pouch is always well developed.[b]

**Sideroxylon capiri** (Moc. & Sess.) Pittier.

PLATE 96, *d*. FIGURE 89.

*Lucuma? capiri* A. DC. in DC. Prodr. **8:** 173. 1844.

*Sideroxylon mexicanum* Hemsl. Biol. Centr. Amer. Bot. **2:** 296. 1886.

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[a] Symb. Antill. **5:** 132. The author probably refers to the Guadeloupe form (*Duss* 2915), which is certainly a distinct species.

[b] I am indebted to Mr. Juan J. Rodriguez, of Guatemala City, a zealous zoological investigator and a keen observer, for further information in regard to the *tempixque* and other Guatemalan fruit trees. He describes the former as a * * * * "fine looking tree, with dense hard wood. This, however, is not used to any extent, the natives refraining from cutting down the trees for the sake of the fruit, even though this is not very highly esteemed and is more or less sticky. In former times the seeds were commonly used by boys and girls to play the *juego do los cinco*, but later they were replaced by imported marbles; and then the old game was altogether forsaken for the modern *patitos* and others. The larvæ of *Callichroma formosa*, a Cerambycid very conspicuous by its beautiful colors and roselike smell, feed on the tempixque. Beside the latter we have also a *tempixquillo* that appears to belong to the same genus, the fruits of which are smaller, sweeter, and not so sticky * * *."

*Sideroxylon petiolare* A. Gray, Proc. Amer. Acad. **22:** 434. 1887.
*Achras capiri* Moc. & Sess. Pl. Nov. Hist. ed. 2. 48. 1893; Fl. Mex. ed. 2. 84. 1894.

A tree over 15 meters high, with numerous, alternating and spreading limbs. Older parts of the branchlets defoliate, glabrous, with a reddish brown bark; new growth leaf-bearing, ferruginose-tomentose.

Leaves thick, long-petiolate, crowded at the end of the branchlets, more or less covered at first with a ferruginose, furfuraceous down, then glabrous or nearly so. Petioles 3 to 7.5 cm. long, canaliculate. Leaf blades 7 to 15 cm. long, 4 to 7.5 cm. broad, varying in shape from ovate to elliptic-lanceolate, abruptly acuminate at the base, rounded or acuminate but nearly always apiculate at tip, deep green above, paler beneath; margin wavy, provided all around with a whitish, torulose border; costa canaliculate above, prominent beneath; primary veins 14 or 15, slightly prominent on both faces.

Floral clusters with 14 flowers or less, the pedicels sometimes intermingled with small, obtuse bracts (or undeveloped floral buds?). Pedicels of opened flowers about 11 mm. long, slender, tomentose or pubescent. Calyx 5-phyllous, 4 mm. long, sepals suborbicular, obtuse at tip, the exterior ones thick and quite pubescent outside, the interior ones a little smaller and scarious on the margin. Corolla spreading (13 mm. in diameter, pale yellow, 5 (seldom 6)-lobate; tube very short (less than 1 mm.); lobes ovate-oblong, concave, auriculate at the base, rounded at tip, about 5 mm. long, hairy-furfuraceous on the back in the bud, glabrous or pubescent later. Staminodes 1.5 to 2 mm. long, irregularly denticulate, mostly subulate. Stamens shorter than the corolla; free part of the filaments 3 to 3.5 mm. long, geniculate and subulate; anthers ovate-acuminate, cordate at base, 2.5 to 3 mm. long, the connective bicuspidate at the tip. Pistil glabrous, 4.5 mm. long; ovary ovoid-elliptic, 5 (seldom 6)-celled; style obtuse.




FIG. 89.—*Sideroxylon capiri*, floral details. *a*, Corolla lobe with stamen; *b*, stamens; *c*, staminodes; *d*, pistil. Scale 3.

Fruit variable in shape but mostly ovoid-acuminate, 3 to 3.5 cm. long and at least 2 cm. in diameter when fresh; peduncles nearly 1 cm. long; calyx persistent, as is the thickened style, at the pointed end of the drupe; skin and sarcocarp yellow, the former quite smooth. Seeds elongate-ovoid, about 2.5 cm. long; umbilical area ovate-acuminate, surrounded by a torulose swelling of the base of the seed.

MEXICO: Jürgensen no. 212 in the Kew Herbarium, without precise locality (type of *S. mexicanum* Hemsl.); warm zone of Michoacan (*Achras capiri* Moc. & Sess., *Lucuma capiri* A. DC.), where it has been collected more recently in the mountains of the center of the State, at Ario, by N. Leon (Museo nacional, Mexico, no. 6; United States National Herbarium no. 347010, labeled *S. mexicanum*); barranca near Guadalajara (Jalisco), Palmer, flowers and fruits, June, 1886 (*Palmer* 131, 135, 136, Gray's types).

There is no doubt left in my mind as to the taxonomic identity of the four species as given above. Mociño & Sessé's descriptions agree closely with our specimens, except in the shape of the fruit. This is given as "subglobose" and in the Calques et Dessins de la Flore mexicaine, plate 749, it appears as a globose-depressed apple. But the seed is given a figure more in accordance with our present knowledge, and, as there is a necessary correlation in the shape of the two parts, it is hardly conceivable that an ovoid stone would find a place in the axis of a depressed-globose fruit; so we may assume that the sketch of the latter was drawn from memory or based upon inaccurate information. All other details in the description and drawings point to a Sideroxylon, not far removed from *S. tempisque* from Gautemala, and it is not likely hat the analogy would fail in the form of the fruit only.

Alphonse de Candolle's description of his *Lucuma? capiri* is founded on the "Calques et Dessins" and partakes of their inaccuracies. As the author himself acknowledges in his "Phytographie,"[a] "although these drawings are generally exact," they are not quite satisfactory as types of new species. Nevertheless, taken as a whole, the description agrees wonderfully, except for the fruit, with the specimens described here.

With due allowance for the "personal equation," the tree described by Hemsley corresponds satisfactorily with the materials in the U. S. National Herbarium, except for the lesser dimensions of the leaves, the 10 to 12 instead of 14 or 15 primary veins, and the hirsute ovary. It may be inferred from the fact that the fuzzy pubescence on the back of the corolla lobes in their earlier stage is given as a character that the Kew specimens are undeveloped ones; this would also explain the discrepancy in the size of the leaves and the number of primary veins; the former are "molliter ferrugineo-hirsuta" only when young, the thick pubescence then hiding the terminal venation. The "ovarium hirsutum," however, is not so easily explained in the absence of the type specimens.

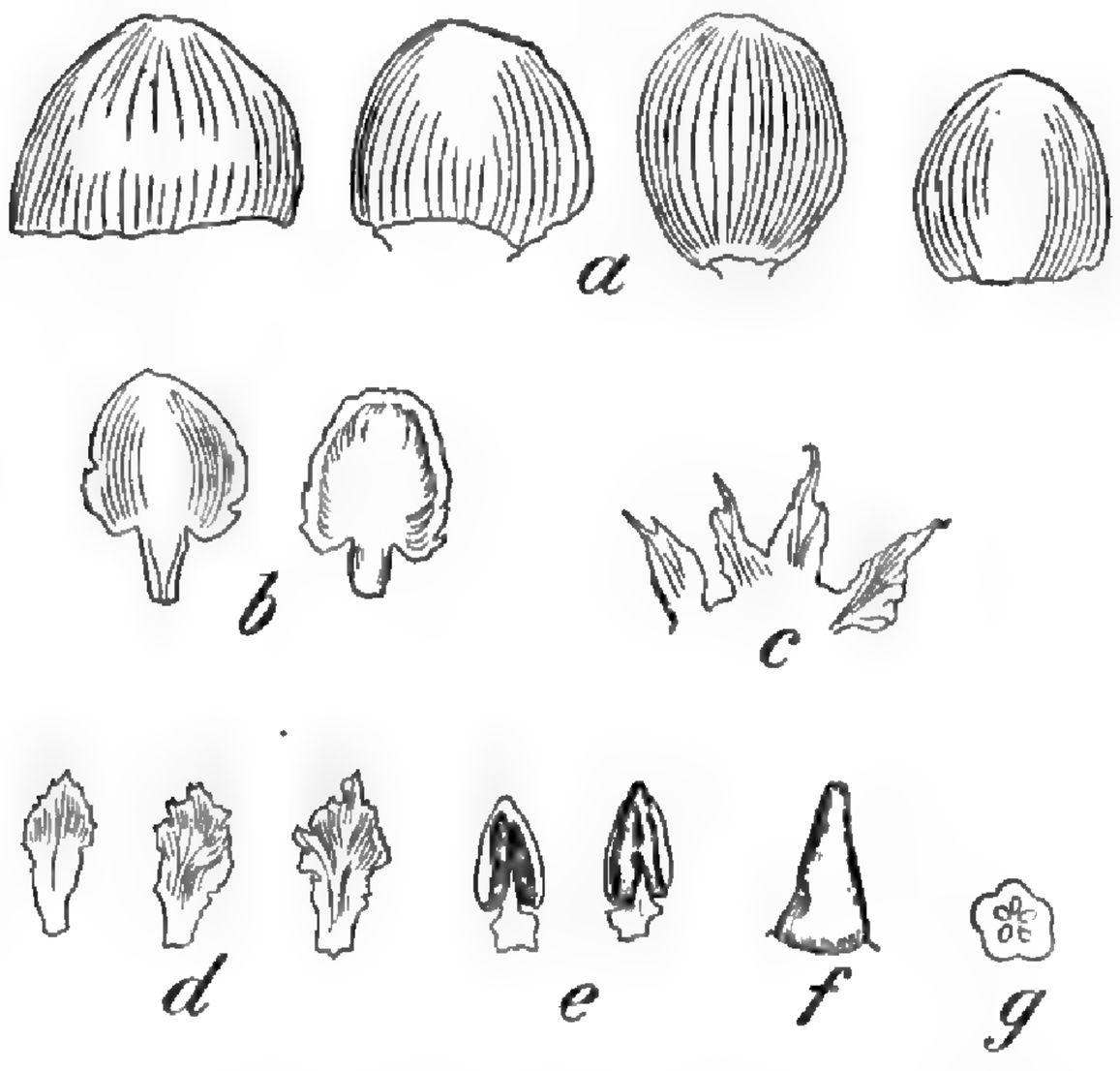



FIG. 90.—*Dipholis minutiflora*, floral details. *a*, Four sepals, that at the left exterior, that at the right interior (fourth sepal wanting); *b*, two exterior corolla lobes; *c*, interior corolla lobes; *d*, staminodes; *e*, stamens; *f*, pistil; *g*, cross section of ovary. Scale 6.

The only serious discrepancy between Gray's description and the specimens at hand, which belong to the same numbers of the same set as those on which he established his species, is in the length of the leaves, this being underestimated.

The specimens of the Mexico National Museum come from the mountains of the State of Michoacan, on the western slope of Mexico, where the tree was first noticed. Those collected by Palmer grew farther north in the neighboring State of Jalisco, in the same altitudinal zone. The exact origin of the Kew specimens is unknown, but it is known that Jürgensen, in the employ of Galeotti, collected principally in the mountains of Oaxaca.

The name *capiri*, already given to the tree in time of Mociño, again appears on the labels of the specimens collected by Leon, and this is also a good incidental confirmation of the view expressed at the beginning as to the definitive reduction of *Lucuma capiri*, *Sideroxylon mexicanum*, and *S. petiolare* to the primitive *Achras capiri* Moc. & Sess., which now becomes *Sideroxylon capiri*.

## A NEW SPECIES OF DIPHOLIS AND ONE OF MIMUSOPS.

**Dipholis minutiflora** Pittier, sp. nov. FIGURE 90.

A small tree with dry bark and reddish, very hard wood. Twigs terete or subangulose, the newest ones whitish-tomentose, the oldest substriate and lenticellose. Buds ferruginose-pubescent.

Petioles 1.5 to 2 cm. long, canaliculate, minutely pubescent. Leaf blades coriaceous, obovate or oblong, 4 to 8 cm. long, 2 to 4 cm. broad, acute-rounded at base, obtuse, or broadly rounded and sometimes emarginate at the tip, light green above, paler or brownish beneath; main rib impressed above, prominent and obscurely silky-

[a] Page 141.

pubescent beneath; primary veins 9 to 11 on each side, prominent beneath, distant 4 to 8 mm., inflexed toward the end, delicately anastomosed and forming with the main rib an angle of about 64°; margin revolute.

Flowers very small (floral buds 2.5 mm. long, 2 mm. in diameter), in glomerules of 2 to 12 above the scars of the fallen leaves of the preceding season. Pedicels 5 to 7 mm. long, sparsely and minutely pubescent, each provided at the base with a very small, ovate stipule. Sepals 5, conchoid and rather thick, ovate-orbiculate or semi-orbicular, 1.8 to 2.2 mm. long, 1.7 to 2.5 mm. broad. Corolla white, about 1.8 mm. long, with a very short (0.5 mm.) tube; exterior lobes 5, rounded-ovate, emarginate at base, 1.3 mm. long, 1.5 mm. broad; interior lobes 10 in 5 pairs alternating with the exterior ones, lanceolate, irregularly lobulate-denticulate, long-acuminate, 1 to 1.2 mm. long. Stamens 5, extrorse, opposite the outside lobes; filaments very short (0.5 mm.); anthers ovate-acuminate, cordate at base, 1 mm. long. Staminodes 5, petaloid, ovate-apiculate, minutely denticulate, about 1 mm. long and 0.6 mm. broad. Pistil conical, 1.5 mm. high and 0.8 mm. in diameter at the base; ovary depressed, 5-celled, each cell 1-ovulate.

Berry single, borne on a pedicel 1 cm. long, ovate, about 3 cm. long and 2 cm. in diameter, yellow at maturity. Seed almost globose but slightly depressed and carinate back of the umbilicus, about 16 mm. long and of a rich dark brown color; umbilical area near the apex, ovate, pale brown, surrounded by a deep furrow.

Nearly related to *Dipholis nigra* Griseb., a native of Jamaica, but the flowers are smaller, the corolla about equal in length with the calyx and not half longer, the interior appendages lanceolate and not cordate-deltoid, the berry and seed about twice as large. Besides the leaves of *D. minutiflora* are smaller, coriaceous, obovate-obtuse and with the nervation very prominent beneath.

Type in the U. S. National Herbarium, no. 333967, collected in forests of El Copey, Dota Mountains, Costa Rica, altitude about 1,800 meters, February, 1898, by A. Tonduz. Flowers and fruits. Same, Instituto fís. geog. Costa Rica (no. 11935).

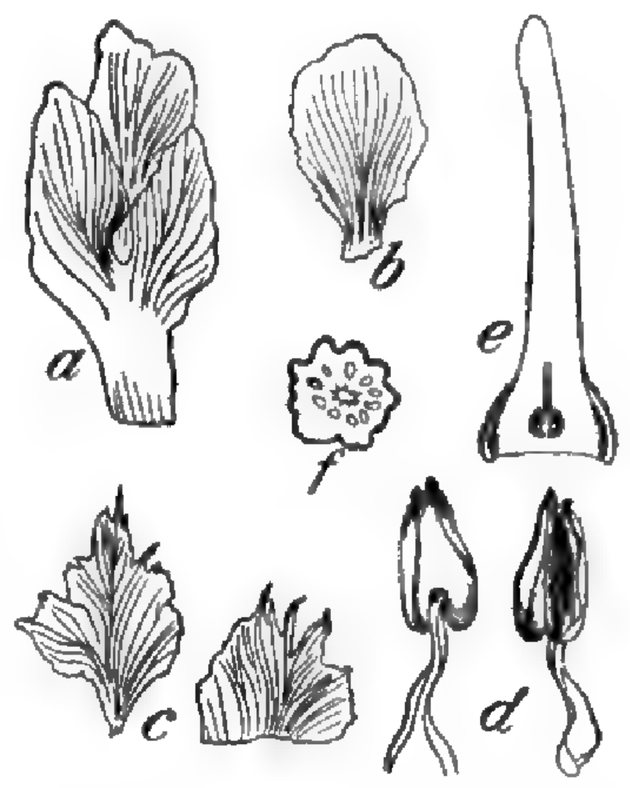



FIG. 91.—*Mimusops spectabilis*, floral details. *a*, Segment of corolla, back (outer) view, showing two exterior and one interior lobe; *b*, interior corolla lobe; *c*, two staminodes, spread; *d*, stamens; *e*, pistil longitudinally split; *f*, section across ovary. Scale 3.

**Mimusops spectabilis** Pittier, sp. nov. FIGURE 91.

A beautiful and very large tree, the straight trunk often reaching a height of 40 meters; bark brown; crown broad and depressed. Branchlets thick (7 to 10 mm. in diameter), with rugose, striate, grayish bark. Foliar scars small, impressed, more or less regularly semilunar. Floral scars 1 to 3 together on a more or less prominent knob, inserted above the foliar scar.

Leaves coriaceous, glabrous, deciduous, clustered at the ends of the twigs. Petioles rather slender, 2.5 to 3.5 cm. long, rounded, scarcely canaliculate. Leaf blades elliptic-oblong, cuneate-rounded at the base, obtuse or subacute at the tip, 12 to 15 cm. long, 5 to 6 cm. broad, light green above, brownish or yellowish green beneath; main rib rounded and very prominent beneath, sulcate above; primary veins 20 to 25, very thin, anastomosed at the marginal ends and delicately prominent beneath, scarcely noticeable above; margin revolute (in dry specimens).

Flowers in fascicles of 1 to 3 in the axils of fallen leaves. Pedicels 8 to 12 mm. long, fuzzy-tomentose. Sepals 6, biseriate, ovate or ovate-oblong, 6 to 7 mm. long, 4 to 5 mm. broad, coriaceous, grayish and velvety-tomentose outside, smooth inside. Corolla tubulose, about 7 mm. long; tube 2.5 to 3 mm. long; exterior lobes 12, ovate-oblong, obtuse at tip, with a sinuate margin, about 3 mm. long and 1.7 mm. broad, slightly pubescent on the back; interior lobes 6, ovate, attenuate at base, rounded at tip, 4 mm. long and 2.5 mm. broad. Stamens 6; filaments free, broadened at the

base, angular, 3 to 3.5 mm. long; anthers dorsifix, deeply cordate, bifid at the tip, 2 to 2.7 mm. long; staminodes 6, longitudinally plicate, each spreading into an ovate-angulose, irregularly dentate-laciniate leaflet, 3.5 to 4 mm. long, but alternately broad and narrow. Pistil about 7.5 mm. long, obscurely 10-sulcate; ovary semiglobose, grayish-pubescent, 10-celled; style glabrous, slightly exserted.

Type in the U. S. National Herbarium, no. 592583, collected in forest close to the seashore at Piuta near Port Limon, September, 1899, by Henry Pittier. Flowers. Same in Instituto fis. geog. Costa Rica (no. 16012).

This noble tree is conspicuous by its towering proportions among the constituents of the littoral forest of the Atlantic coast. Its closest affinities seem to be with *M. longifolia* from Brazil, but it has very pronounced features of its own. It is the first species of the genus reported from Central America.

*Mimusops spectabilis* is one of the *nísperos* of the Costa Ricans and the Jamaica immigrants call it *bully tree*, on account of the likeness of its wood to that of *M. sideroxylon* Pierre. The wood is hard, heavy, and dark, and, as it is very resistant to water and wet soil, it is in great demand for railroad ties.

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